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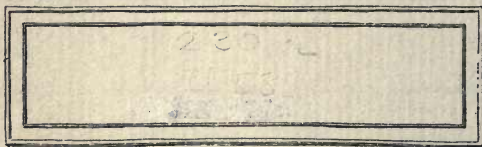
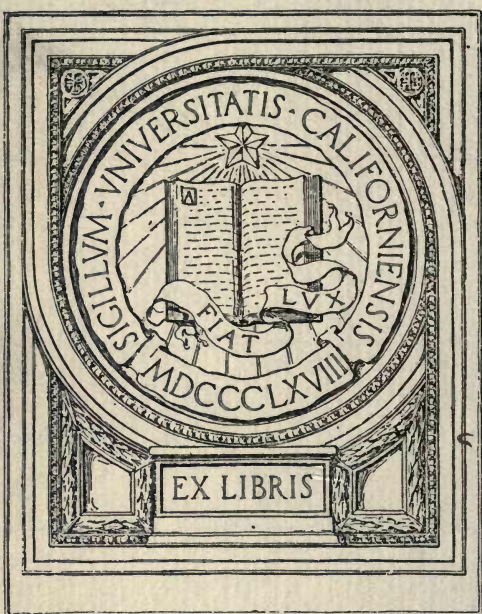
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RAINFALL AND WEATHER REVIEW

From September 1, 1849, to December 31, 1884.

By JAMES A. BARWICK,

OBSERVER SERGEANT SIGNAL CORPS U. S. A., IN CHARGE OF THE U. S. SIGNAL OFFICE IN
SACRAMENTO, CALIFORNIA.

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AUGUST 1940

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RAINFALL AND WEATHER REVIEW.

FROM SEPTEMBER 1, 1849, TO DECEMBER 31, 1882.

BY JAMES A. BARWICK, OBSERVER SERGEANT SIGNAL CORPS, U. S. ARMY,
CHARGE OF THE U. S. SIGNAL OFFICE IN SACRAMENTO, CALIFORNIA.

RAINFALL FOR THE WINTER SEASONS.

The following tabulated statement shows the rainfall and number of days that rain fell for each Winter month; also, the total rainfall and total number of days that rain fell during the entire Winter seasons; the Winter seasons beginning with the Winter of 1852-3, and ending with the Winter of 1883-4. The three Winter months composing the Winter season that gave the heaviest rainfall was during the Winter of 1861-2: 27.94 inches. The driest Winter was that of 1863-4: 3.08 inches. The mean average rainfall for the Winter season, for the past thirty-two years, was 11.393 inches. We might judge from this that we should never have a Winter season of over twenty-eight inches, or one of less than three inches rainfall:

WINTER OF—	DECEMBER.		JANUARY.		FEBRUARY.		Total for Winter Months.	Total No. Days for Winter.
	Inches.	No. of Days.	Inches.	No. of Days.	Inches.	No. of Days.		
1852-3	13.41	20	3.00	12	2.00	6	18.41	38
1853-4	1.54	4	3.25	6	8.50	14	13.29	24
1854-5	1.15	8	2.67	15	3.46	7	7.28	30
1855-6	2.00	13	4.92	16	.69	6	7.61	35
1856-7	2.40	13	1.38	14	4.80	17	8.58	44
1857-8	2.63	13	2.44	21	2.46	13	7.53	47
1858-9	4.34	17	.96	19	3.91	18	9.21	54
1859-60	1.83	17	2.31	15	.93	14	5.07	46
1860-1	4.28	20	2.67	10	2.92	9	9.87	39
1861-2	8.64	22	15.04	20	4.26	11	27.94	53
1862-3	2.33	11	1.73	10	2.75	11	6.81	32
1863-4	1.82	10	1.08	7	.19	2	3.09	19
1864-5	7.87	16	4.78	13	.71	6	13.36	35
1865-6	.36	9	7.70	18	2.01	11	10.07	38
1866-7	9.51	21	3.44	15	7.10	9	20.05	45
1867-8	12.85	18	6.04	17	3.15	9	22.04	44
1868-9	2.61	11	4.79	14	3.63	5	11.03	30
1869-70	1.96	7	1.37	9	3.24	11	6.57	27
1870-1	.97	6	2.08	8	1.92	11	4.97	25
1871-2	10.59	22	4.04	11	4.74	18	19.37	51
1872-3	5.39	13	1.23	10	4.46	17	11.08	40
1873-4	10.01	21	5.20	14	1.86	9	17.07	44
1874-5	.44	17	8.70	14	.55	2	9.69	33
1875-6	5.52	14	4.99	13	3.75	10	14.26	37
1876-7			2.77	11	1.04	9	3.81	20
1877-8	1.43	5	9.26	17	8.04	17	18.73	39
1878-9	.47	3	3.18	11	3.88	9	7.53	23
1879-80	3.41	12	1.64	7	1.83	10	6.88	29
1880-1	11.81	21	6.14	9	5.06	13	23.01	43
1881-2	3.27	11	1.89	8	2.40	6	7.56	25
1882-3	1.13	8	2.23	4	1.11	3	4.47	15
1883-4	.44	6	3.43	9	4.46	10	8.33	25
Totals	136.41	409	126.35	397	101.81	323	364.57	1,129
Averages for 32 y'rs.	4.262	12.8	3.948	12.4	3.182	10.1	11.393	35.3

MEAN SPRING RAINFALL.

The table below will be found to contain the record of rainfall and number of days rain fell during the Spring months and for the Spring season. It informs us that the wettest Spring season was that of 1880—16.66 inches; and the driest was that of 1857—.68 of an inch; the mean average for thirty-two years being 5.358 inches, showing a deficiency of nearly 5 inches in the dry season of 1857, and an excess of 11.532 inches during the wet Spring of 1880, as compared with a thirty-two years average:

SPRING OF—	MARCH.		APRIL.		MAY.		Total for Spring Months.	Total No. Days for Spring.
	Inches.	No. of Days.	Inches.	No. of Days.	Inches.	No. of Days.		
1853 -----	7.00	8	3.50	7	1.45	4	11.95	19
1854 -----	3.25	4	1.50	9	.21	4	4.96	17
1855 -----	4.20	9	4.32	9	1.15	6	9.67	24
1856 -----	1.40	5	2.13	8	1.84	4	5.37	17
1857 -----	.68	10	Sprink	1	Sprink	3	.68	14
1858 -----	2.88	13	1.21	3	.20	4	4.29	20
1859 -----	1.64	14	.98	6	1.04	4	3.66	24
1860 -----	5.11	17	2.87	8	2.49	10	10.47	35
1861 -----	3.32	7	.48	4	.59	3	4.39	14
1862 -----	2.80	15	.82	9	1.81	9	5.43	33
1863 -----	2.36	10	1.69	9	.36	2	4.41	21
1864 -----	1.30	12	1.08	4	.74	8	3.12	24
1865 -----	.48	7	1.37	3	.46	2	2.31	12
1866 -----	2.02	11	.48	6	2.25	5	4.75	22
1867 -----	1.01	6	1.80	7	.01	1	2.82	14
1868 -----	4.35	12	2.31	9	.27	2	6.93	23
1869 -----	2.94	12	1.24	5	.65	2	4.83	19
1870 -----	1.64	6	2.12	7	.27	1	4.03	14
1871 -----	.69	8	1.45	6	.76	5	2.90	19
1872 -----	1.94	10	.61	6	.28	3	2.83	19
1873 -----	.55	4	.51	4			1.06	8
1874 -----	3.05	10	.89	10	.37	6	4.31	26
1875 -----	.80	9	Sprink	3	Sprink	1	.83	13
1876 -----	4.15	13	1.10	10	.15	4	5.40	27
1877 -----	.56	7	.19	7	.64	6	1.39	20
1878 -----	3.09	14	1.07	3	.17	4	4.33	21
1879 -----	4.88	14	2.66	12	1.30	5	8.84	31
1880 -----	1.70	7	14.20	15	.76	3	16.66	25
1881 -----	1.37	6	1.64	6	Sprink	1	3.01	13
1882 -----	3.78	10	1.99	8	.35	1	6.12	19
1883 -----	3.70	6	.67	7	2.85	9	7.22	22
1884 -----	8.14	13	4.32	9	.06	3	12.52	25
Totals -----	86.78	309	61.20	220	23.48	125	171.46	654
Averages for 32 y'rs.	2.712	9.7	1.912	6.9	.734	3.9	5.358	20.4

MEAN SUMMER RAINFALL.

In the recorded statement below will be found the rainfall for each month of our dry or Summer season; also the total for the season, as well as the total number of days, etc., that rain fell. The average for the thirty-two years past is .170 of an inch. The Summer season that gave the most rainfall was that of 1884—1.45 inches. But five seasons of the thirty-two gave none, those being 1859, 1863, 1867, 1878, and 1883:

SUMMER OF—	JUNE.		JULY.		AUGUST.		Total for Summer Months.	Total No. Days for Summer.
	Inches.	No. of Days.	Inches.	No. of Days.	Inches.	No. of Days.		
1853	Sprink	1	Sprink	2			Sprink	3
1854	.31	2	Sprink		Sprink	1	.31	3
1855	.01	1					.01	1
1856	.03	1					.03	1
1857	.35	2			Sprink	1	.35	3
1858	.10	2	.01	1	Sprink	4	.11	7
1859								
1860	.02	2	.03				.05	2
1861	.14	4	.55	3			.69	7
1862	.01	1			.01	1	.02	2
1863								
1864	.09	3			.08	6	.17	9
1865			Sprink	3				3
1866	.10	2	.02	3			.12	5
1867								
1868	Sprink	3					Sprink	3
1869	.01	1					.01	1
1870	Sprink	1	Sprink	1	Sprink	1	Sprink	3
1871	Sprink	1					Sprink	1
1872	.02	1					.02	1
1873	Sprink	1	.02	2	Sprink	1	.02	4
1874	Sprink	2	Sprink	1			Sprink	3
1875	1.10	2					1.10	2
1876			.21	2	.02	1	.23	3
1877	.01	1	Sprink	1	Sprink	1	.01	3
1878								
1879	.13	1	Sprink	1	Sprink	1	.13	3
1880			Sprink	1			Sprink	1
1881	.50	2	Sprink	1			.50	3
1882	.10	1	Sprink	1			.10	2
1883								
1884	1.45	7			Sprink	1	1.45	8
Totals	4.48	45	.84	23	.11	19	5.43	87
Averages for 32 y'rs.	1.40	1.4	.026	0.7	.003	0.6	.170	2.7

MEAN AUTUMNAL RAINFALL.

The table following shows the Autumn rainfall by months and total for the Fall season, both of rainfall and number of days rain fell, for the last thirty-two years, the wettest being the Fall season of 1864—6.84 inches; the driest being that of 1880—.05 of an inch:

FALL OF—	SEPTEMBER.		OCTOBER.		NOVEMBER.		Total for Autumn Months.	Total No. Days for Autumn.
	Inches.	No. of Days.	Inches.	No. of Days.	Inches.	No. of Days.		
1853.....	Sprink	1	Sprink	1	1.50	5	1.50	7
1854.....	Sprink	1	1.01	11	.65	2	1.66	14
1855.....	Sprink	1	-----	-----	.75	9	.75	10
1856.....	Sprink	1	.20	6	.65	10	.85	17
1857.....	-----	-----	.65	3	2.41	10	3.06	13
1858.....	Sprink	5	3.01	5	.15	11	3.16	21
1859.....	.02	3	-----	-----	6.48	15	6.50	18
1860.....	.06	2	.91	9	.18	5	1.15	16
1861.....	-----	-----	Sprink	1	2.17	12	2.17	13
1862.....	-----	-----	.36	6	Sprink	2	.36	8
1863.....	Sprink	1	-----	-----	1.49	7	1.49	8
1864.....	Sprink	1	.12	2	6.72	9	6.84	12
1865.....	.08	4	.48	5	2.43	9	2.99	18
1866.....	-----	-----	Sprink	1	2.43	8	2.43	9
1867.....	.01	1	-----	-----	3.81	6	3.82	7
1868.....	-----	-----	-----	-----	.77	5	.77	5
1869.....	Sprink	1	2.12	2	.85	5	2.97	8
1870.....	-----	-----	.02	2	.58	6	.60	8
1871.....	Sprink	1	.21	1	1.22	8	1.43	10
1872.....	Sprink	2	.22	2	1.93	4	2.15	8
1873.....	-----	-----	.31	4	1.21	5	1.52	9
1874.....	.05	1	2.26	8	3.80	9	6.11	18
1875.....	-----	-----	.44	4	6.20	10	6.64	14
1876.....	Sprink	1	3.45	7	.30	1	3.75	9
1877.....	-----	-----	.73	5	1.07	7	1.80	12
1878.....	.29	3	.55	1	.51	3	1.35	7
1879.....	-----	-----	.88	4	2.05	8	2.93	12
1880.....	-----	-----	-----	-----	.05	2	.05	2
1881.....	.30	1	.55	6	1.88	4	2.73	11
1882.....	.57	2	2.63	6	3.22	7	6.42	15
1883.....	.90	2	.97	6	.61	3	2.48	11
1884.....	.60	3	2.01	4	-----	-----	2.61	7
Totals.....	2.88	38	24.09	112	58.07	207	85.04	357
Averages for 32 years.	.090	1.2	.753	3.5	1.815	6.5	2.658	11.2

YEARLY AND SEASONAL RAINFALL, ETC.

The instructive tabulated information below gives the rainfall annually—that is, from January to December of each year—for thirty-two years. Also, the rainfall by seasons, beginning with September 1st of one year and ending with August 31st of the next year, the wettest season being 1861-2—35.56 inches; the driest that of 1863-4—7.86 inches; the wettest calendar year being 1880—31.99 inches; the driest being 1877—8.43 inches; the mean average seasonal rainfall for thirty-one years being 19.143 inches; the mean average for the year, or the mean annual average, being 19.480 inches. The difference between the mean average rainfall, calculating from January 1st to December 31st of each year, and from September 1st of one year to August 31st of next year, is only .337 of an inch in favor of the calendar year:

YEAR OF—	Yearly Rainfall.	Total No. of Days Rain Fell.	Season of—	Rainfall—Inches.	Total No. of Days.
1853	19.99	51			
1854	19.83	62	1853-54	20.06	51
1855	18.56	70	1854-55	18.62	69
1856	14.26	70	1855-56	13.76	63
1857	12.91	74	1856-57	10.46	78
1858	16.80	99	1857-58	15.00	87
1859	16.86	97	1858-59	16.03	100
1860	19.19	72	1859-60	22.09	101
1861	21.38	75	1860-61	16.10	76
1862	27.44	85	1861-62	35.56	100
1863	12.20	60	1862-63	11.58	64
1864	19.27	67	1863-64	7.87	57
1865	11.15	61	1864-65	22.51	62
1866	26.52	86	1865-66	17.93	83
1867	30.03	63	1866-67	25.30	72
1868	19.50	68	1867-68	32.79	78
1869	18.19	52	1868-69	16.64	58
1870	10.21	51	1869-70	13.57	52
1871	18.92	71	1870-71	8.47	53
1872	19.17	70	1871-72	23.65	83
1873	18.20	69	1872-73	14.21	60
1874	17.92	87	1873-74	22.90	82
1875	23.31	59	1874-75	17.70	71
1876	18.12	62	1875-76	26.53	75
1877	8.44	60	1876-77	8.96	54
1878	23.45	65	1877-78	24.86	72
1879	22.37	78	1878-79	17.85	64
1880	31.99	66	1879-80	26.47	67
1881	20.71	60	1880-81	26.57	61
1882	18.06	58	1881-82	16.51	57
1883	13.48	46	1882-83	18.11	52
1884	34.92	70	1883-84	24.78	68
Totals	623.35	2,184		593.44	2,170
Averages	*19.480	68.2		†19.143	70.0

* Mean for thirty-two years.

† Mean for thirty-one seasons.

MEAN WINTER TEMPERATURE.

The tabulated statement below shows the average temperature by months, and for the season also, of the Winter seasons, beginning with the season of 1853-4 and ending with the one of 1883-4; also, showing a mean average for thirty-one years. Judging from the average temperature for each season, we must conclude that the season of 1879-80 was the coldest—44.5°; the warmest being the season of 1881—51.0°; the mean average of thirty-one years being 48.3°.

WINTER SEASON OF—	Mean Temp.— December.	Mean Temp.— January.	Mean Temp.— February.	Mean Winter Temperature.
1853-54 -----	48.0	43.0	51.0	47.3
1854-55 -----	47.9	43.7	52.5	48.0
1855-56 -----	46.0	48.0	52.6	48.9
1856-57 -----	43.9	48.5	50.2	47.5
1857-58 -----	47.4	45.0	52.2	48.2
1858-59 -----	44.5	44.9	50.5	46.6
1859-60 -----	43.5	46.2	49.8	46.5
1860-61 -----	49.3	47.1	52.2	49.5
1861-62 -----	50.9	46.4	47.5	48.3
1862-63 -----	46.4	46.9	48.0	47.1
1863-64 -----	46.5	49.2	53.6	49.8
1864-65 -----	50.2	47.4	49.0	48.9
1865-66 -----	44.1	46.5	63.5	51.4
1866-67 -----	50.2	48.2	47.8	48.7
1867-68 -----	46.8	47.0	50.5	48.1
1868-69 -----	47.0	47.6	49.9	48.2
1869-70 -----	46.5	48.6	51.1	48.7
1870-71 -----	45.5	48.3	49.4	47.7
1871-72 -----	48.7	48.5	53.3	50.2
1872-73 -----	49.0	52.7	48.2	50.0
1873-74 -----	47.7	45.7	49.3	47.6
1874-75 -----	45.0	46.9	52.7	48.2
1875-76 -----	48.0	48.8	50.2	49.0
1876-77 -----	45.5	49.1	55.0	49.9
1877-78 -----	48.6	49.7	51.3	49.9
1878-79 -----	47.2	45.5	55.0	49.2
1879-80 -----	44.0	43.5	46.0	44.5
1880-81 -----	50.3	49.2	53.5	51.0
1881-82 -----	46.2	45.1	46.3	45.9
1882-83 -----	48.2	41.9	46.0	45.4
1883-84 -----	44.2	46.6	46.9	45.9
Totals -----	1457.2	1455.7	1575.0	1496.1
Averages for 31 years -----	47.0	47.0	50.8	48.3



MEAN SPRING TEMPERATURE.

The table below will be found to contain the average temperature by months for the Spring, also for the season. The warmest one, as indicated by its average temperature, was 1853—62.9°; the coldest, 1880—55.0°; the mean average Spring temperature being 59.5°.

SPRING SEASON OF—	Mean Temp.— March.	Mean Temp.— April.	Mean Temp.— May.	Mean Spring Temperature.
1853-----	59.8	61.0	68.0	62.9
1854-----	53.0	60.0	62.0	58.3
1855-----	54.8	58.1	60.2	57.7
1856-----	57.0	58.8	63.9	59.9
1857-----	56.4	63.3	65.5	61.7
1858-----	53.7	59.8	65.2	59.6
1859-----	51.5	57.1	63.0	57.2
1860-----	53.3	57.8	58.5	56.5
1861-----	55.0	60.6	63.7	59.8
1862-----	53.6	58.0	61.2	57.6
1863-----	57.6	59.5	67.1	61.4
1864-----	56.1	62.1	68.5	62.2
1865-----	53.6	59.3	70.2	61.0
1866-----	54.2	61.9	63.1	59.7
1867-----	50.7	59.7	64.4	58.3
1868-----	55.0	60.1	64.2	59.8
1869-----	53.6	59.0	64.2	58.9
1870-----	53.0	57.0	61.0	57.0
1871-----	56.0	59.2	61.5	58.3
1872-----	56.8	57.6	67.0	60.5
1873-----	56.8	60.0	67.9	61.6
1874-----	52.9	59.5	64.7	59.0
1875-----	58.7	63.0	68.1	63.3
1876-----	54.6	59.5	65.7	59.9
1877-----	59.0	60.2	64.5	61.2
1878-----	56.7	59.4	65.5	60.5
1879-----	57.4	60.3	60.2	59.3
1880-----	48.8	54.6	61.6	55.0
1881-----	55.5	60.8	64.8	60.4
1882-----	53.0	55.8	64.0	57.6
1883-----	56.9	56.0	62.6	58.5
1884-----	52.9	56.7	64.0	57.9
Totals -----	1757.9	1895.7	2056.0	1903.1
Averages for 32 years-----	54.9	59.2	64.2	59.5

MEAN SUMMER TEMPERATURE.

The average temperature in the following table is for the Summer months and for the Summer season, showing by their average temperature that 1866 was the warmest—74.8°; and the coldest to have been 1880—69.1°; the mean average for thirty-two years is 71.7°; the season of 1866 being 2.9° above the mean average, and 1880 being 2.6° below the mean average for the past thirty-two years. It also appears that the mean average temperature for the past thirty-two years for June, July, and August, was in the seventies, which gives us to understand that the three Summer months are usually of even degrees of temperature, with July a little the warmest of the three:

SUMMER SEASON OF—	Mean Temp.— June.	Mean Temp.— July.	Mean Temp.— August.	Mean Summer Temperature.
1853 -----	77.0	75.0	71.0	74.3
1854 -----	67.0	80.6	69.5	72.4
1855 -----	71.1	72.5	73.0	72.2
1856 -----	71.1	75.1	69.6	71.9
1857 -----	71.9	71.4	71.3	71.5
1858 -----	69.4	70.8	70.6	70.3
1859 -----	74.8	69.1	67.2	70.4
1860 -----	65.6	73.2	73.5	70.8
1861 -----	66.2	73.6	69.7	69.8
1862 -----	69.3	73.2	75.0	72.5
1863 -----	69.1	75.6	70.7	71.8
1864 -----	71.1	74.8	74.7	73.5
1865 -----	73.5	74.0	71.7	73.1
1866 -----	72.2	76.2	76.0	74.8
1867 -----	70.3	73.7	71.7	71.9
1868 -----	69.5	73.8	71.2	71.5
1869 -----	70.8	74.3	71.3	72.1
1870 -----	69.3	71.8	72.6	71.2
1871 -----	70.1	70.2	72.0	70.8
1872 -----	69.2	71.4	73.1	71.6
1873 -----	71.7	73.2	66.3	70.4
1874 -----	70.2	72.8	70.9	71.3
1875 -----	70.6	73.3	72.5	72.1
1876 -----	76.9	74.0	72.8	74.6
1877 -----	72.5	75.0	72.9	73.5
1878 -----	71.8	73.4	73.4	72.9
1879 -----	72.1	71.8	74.7	72.9
1880 -----	66.6	70.9	69.7	69.1
1881 -----	66.0	71.1	68.2	68.5
1882 -----	68.1	73.4	71.9	71.1
1883 -----	72.6	73.1	71.4	72.4
1884 -----	65.8	71.2	72.5	69.8
Totals -----	2253.4	2343.5	2292.6	2296.5
Averages for 32 years -----	70.4	73.2	71.6	71.7

MEAN AUTUMN TEMPERATURE.

The average temperature for the Fall season indicates the Fall of 1853 as being the warmest, it being 69.0° ; that of 1881 was the coldest, judging from the average temperature, it being 58.5° . The average mean temperature for thirty-two years past being 61.5° , showing the average of 1853 to have been 7.5° above the mean average, and that of 1881 to have been 3.0° below the mean average temperature for the past thirty-two years:

FALL SEASON OF—	Mean Temp.— September.	Mean Temp.— October.	Mean Temp.— November.	Mean Autumn Temperature.
1853.....	76.0	78.0	53.0	69.0
1854.....	65.0	60.0	55.0	60.0
1855.....	68.0	63.0	50.6	60.5
1856.....	70.9	58.0	52.2	60.4
1857.....	67.9	61.5	53.2	60.9
1858.....	68.9	59.5	54.2	60.9
1859.....	65.9	63.3	54.0	61.1
1860.....	67.6	59.8	53.5	60.3
1861.....	67.8	59.9	53.6	60.4
1862.....	70.4	67.6	53.1	63.7
1863.....	69.0	62.8	52.7	61.5
1864.....	69.8	64.5	53.5	62.6
1865.....	68.8	63.1	56.9	62.9
1866.....	72.2	65.2	53.8	63.7
1867.....	68.8	62.7	54.8	62.1
1868.....	68.3	62.0	53.9	61.4
1869.....	69.9	63.1	54.0	62.3
1870.....	68.0	63.6	53.4	61.7
1871.....	67.4	62.2	50.2	59.9
1872.....	68.8	58.9	51.2	59.6
1873.....	69.9	61.4	57.5	62.9
1874.....	70.7	61.7	53.9	62.1
1875.....	55.7	69.9	56.7	60.8
1876.....	70.1	63.5	53.3	62.3
1877.....	72.7	62.9	54.7	63.4
1878.....	69.0	62.9	55.5	62.5
1879.....	70.4	61.5	50.9	60.9
1880.....	68.0	62.1	49.7	59.9
1881.....	67.8	56.8	50.8	58.5
1882.....	68.4	58.4	49.5	58.8
1883.....	71.6	58.2	50.5	60.1
1884.....	64.8	59.9	55.3	60.0
Totals.....	2198.5	1997.9	1705.1	1967.1
Averages for 32 years.....	68.7	62.4	53.3	61.5

AVERAGE ANNUAL AND SEASONAL TEMPERATURES.

The statement below shows the average temperature, for each year, for thirty-two years, and for the Spring, Summer, and Autumn, for the past thirty-two years, and the average Winter temperature for thirty-one years. The coldest year, inferring from the average temperature, was that of 1880—57.5°; the warmest was 1864—62.8°; the mean average for the past thirty-two years being 60.2°, showing the coldest to have been 2.7° below the mean average, while the warmest year being that of 1864, when it was 2.6° above the mean average for thirty-two years. By careful study of the following table, one is struck by the slight difference between the coldest and warmest year, as compared with a thirty-two years average, generally not more than 3°. That is, we might safely say that the average temperature of any year is not likely to vary more than 3° from 60°, either way, between the hottest and coldest year, as compared with the mean average temperature for the past thirty-two years:

YEAR.	Mean Annual Temperature.	Mean Spring Temperature.	Mean Summer Temperature.	Mean Autumn Temperature.	Mean Winter Temperature.
1853 -----	62.6	62.9	74.3	69.0	* -----
1854 -----	59.5	58.3	72.4	60.0	47.3
1855 -----	59.5	57.7	72.2	60.5	48.0
1856 -----	60.1	59.9	71.9	60.4	48.9
1857 -----	60.7	61.7	71.5	60.9	47.5
1858 -----	59.5	59.6	70.3	60.9	48.2
1859 -----	58.7	57.2	70.4	61.1	46.6
1860 -----	59.0	56.5	70.8	60.3	46.5
1861 -----	60.1	59.8	69.8	60.4	49.5
1862 -----	60.2	57.6	72.5	63.7	48.3
1863 -----	60.3	61.4	71.8	61.5	47.1
1864 -----	62.8	62.2	73.5	62.6	49.8
1865 -----	61.0	61.0	73.1	62.9	48.9
1866 -----	62.1	59.7	74.8	63.7	51.4
1867 -----	59.9	58.3	71.9	62.1	48.7
1868 -----	60.1	59.8	71.5	61.4	48.1
1869 -----	60.4	58.9	72.1	62.3	48.2
1870 -----	59.6	57.0	71.2	61.7	48.7
1871 -----	59.6	58.9	70.8	59.9	47.7
1872 -----	60.4	60.5	71.6	59.6	50.2
1873 -----	60.7	61.6	70.4	62.9	50.0
1874 -----	59.8	59.0	71.3	62.1	47.6
1875 -----	62.5	63.3	72.1	60.8	48.2
1876 -----	61.7	59.9	74.6	62.3	49.0
1877 -----	61.2	61.2	73.5	63.4	49.9
1878 -----	61.3	60.5	72.9	62.5	49.9
1879 -----	60.3	59.3	72.9	60.9	49.2
1880 -----	57.5	55.0	69.1	59.9	44.5
1881 -----	59.2	60.4	68.5	58.5	51.0
1882 -----	58.5	57.6	71.1	58.8	45.9
1883 -----	58.8	58.5	72.4	60.1	45.4
1884 -----	58.8	57.9	69.8	60.0	45.9
Totals -----	1926.4	1903.1	2295.6	1967.1	1496.1
Averages -----	† 60.2	59.5	71.7	61.5	‡ 48.3

* The Winter tables are for the Winters from 1852-3 to 1883-4, both inclusive.

† Mean for thirty-two years.

‡ Mean for thirty-one years.

The following table gives the average annual barometer, thermometer, and hygrometer, the maximum and minimum temperature. The hygrometrical observations is the amount of moisture or relative humidity contained in the atmosphere, also the mean average for seven years:

YEAR.	Mean Annual Barometer.	Mean Annual Relative Humidity.	Mean Annual Temperature.	Max. Yearly Temperature.	Min. Yearly Temperature.
1878 -----	29.946	62.2	61.3	100.5—Aug.	23.5—Dec.
1879 -----	29.998	65.7	60.3	103.0—Aug.	25.0—Dec.
1880 -----	30.025	64.6	57.7	98.0—July	25.0—Jan.
1881 -----	30.026	66.7	59.2	98.6—July	31.9—Dec.
1882 -----	30.030	66.0	58.2	99.8—Aug.	27.0—Dec.
1883 -----	30.034	69.0	58.8	103.5—July	22.0 { Jan. Feb.
1884 -----	29.985	70.7	58.8	100.0—Aug.	21.0—Feb.
Totals -----	210.044	464.9	414.3	Highest, 103.5—1883.	Lowest, 21.0—1884.
Averages -----	30.006	66.4	59.2	-----	-----

The Winter tables following this statement show the average Winter pressure, temperature, and relative humidity, the highest and lowest temperature for the Winter seasons of 1877-8 to 1883-4, and the mean average for seven years:

WINTER OF—	Mean Winter Barometer.	Mean Winter Relative Humidity.	Mean Winter Temperature.	Max. Winter Temperature.	Min. Winter Temperature.
1877-78 -----	30.004	77.1	49.9	67.0—Dec.	27.0—Jan.
1878-79 -----	30.120	68.3	49.2	73.5—Feb.	23.5—Dec.
1879-80 -----	30.163	77.2	44.5	64.0—Feb.	25.0 { Dec. Jan.
1880-81 -----	30.116	84.0	51.0	67.0—Feb.	35.0—Jan.
1881-82 -----	30.169	76.4	45.9	62.8—Feb.	29.0—Dec.
1882-83 -----	30.189	77.9	45.4	71.7—Feb.	22.0 { Jan. Feb.
1883-84 -----	30.120	83.0	45.9	71.0—Feb.	21.0—Feb.
Totals -----	210.881	543.9	331.8	Highest, 73.5—1878-9	Lowest, 21.0—1884.
Averages -----	30.126	77.7	47.3	-----	-----

The average Spring pressure, relative humidity and temperature, the maximum and minimum Spring temperature, also the mean average for seven years past, will be found as follows, viz.:

SPRING OF—	Mean Spring Barometer.	Mean Spring Relative Humidity.	Mean Spring Temperature.	Max. Spring Temperature.	Min. Spring Temperature.
1878 -----	29.936	67.1	60.5	91.0—May	40.0—March
1879 -----	30.046	68.4	59.3	91.0—May	38.0—March
1880 -----	30.061	66.2	55.0	86.0—May	29.0—March
1881 -----	30.006	68.4	60.4	88.8—May	37.0—March
1882 -----	30.037	61.9	57.6	94.6—May	34.1—March
1883 -----	30.009	68.9	58.5	98.0—May	39.8—April
1884 -----	29.968	73.3	57.9	83.0—May	39.0—March
Totals -----	210.063	474.2	409.2	Highest, 98.0—1883.	Lowest, 29.0—1880.
Averages -----	30.009	67.7	58.5	-----	-----

The tabulated statement following indicates the average Summer pressure, relative humidity and temperature, the maximum and minimum Summer temperature, and the mean average for seven years:

SUMMER OF—	Mean Summer Barometer.	Mean Summer Rel. Humidity.	Mean Summer Temperature.	Max. Summer Temperature.	Min. Summer Temperature.
1878 -----	29.817	54.7	72.9	100.5—Aug.	49.0—June
1879 -----	29.821	52.7	72.9	103.0—Aug.	51.0—July
1880 -----	29.880	59.3	69.1	98.0—July	49.0—Aug.
1881 -----	29.903	56.3	68.5	98.6—July	48.0—June
1882 -----	29.898	57.0	71.1	99.8—Aug.	51.2—June
1883 -----	29.908	58.4	72.4	103.5—July	49.8—June
1884 -----	29.919	63.3	69.8	100.0—Aug.	52.9—June
Totals -----	209.146	401.7	496.7	Highest, 103.5—1883.	Lowest, 48.0—1881.
Averages -----	29.878	57.4	71.0	-----	-----

The following table shows the average Autumn pressure, relative humidity and temperature, the maximum and minimum Fall temperature, and the mean averages for the past eight years:

FALL OF—	Mean Fall Barometer.	Mean Fall Rel. Humidity.	Mean Fall Temperature.	Max. Fall Temperature.	Min. Fall Temperature.
1877 -----	29.973	54.3	63.4	88.0—Sept.	37.0—Nov.
1878 -----	29.991	54.4	62.5	92.0—Sept.	34.0—Nov.
1879 -----	30.000	65.2	60.9	96.0—Sept.	33.0—Nov.
1880 -----	30.035	54.9	59.9	92.0—Sept.	27.0—Nov.
1881 -----	30.026	58.4	58.5	96.0—Sept.	32.0—Nov.
1882 -----	30.024	69.6	58.8	99.6—Sept.	34.0—Nov.
1883 -----	30.011	68.8	60.1	101.0—Sept.	29.0—Nov.
1884 -----	30.000	69.1	60.0	93.5—Sept.	37.7—Nov.
Totals -----	240.060	494.7	484.1	Highest, 101.0—1883.	Lowest, 27.0—1880.
Averages -----	30.008	61.8	80.5	-----	-----

The table following will be found to contain the average direction of the wind, the total velocity, the rainfall, and the clear, fair, and cloudy days; also, days rain fell during the Winter months from 1877-8 to 1883-4:

WINTER OF—	Mean Winter Direction.	Velocity for Winter.	Rainfall for Winter.	Clear Days.	Fair Days.	Cloudy Days.	Days Rain Fell.
1877-78-----	S.E.	13.452	18.74	26	28	36	39
1878-79-----	N.	12.650	7.53	44	31	15	23
1879-80-----	S.E.	13.735	6.88	39	17	35	29
1880-81-----	S.E.	16.092	23.01	14	26	50	43
1881-82-----	N.	14.611	7.56	46	26	18	25
1882-83-----	S.E.	11.131	4.47	52	30	8	15
1883-84-----	S.E.	12.294	8.33	47	25	19	25
Totals-----		93.965	76.52	268.	183	181	199
Averages-----	S.E.	13.424	10.931	38.3	26.1	25.9	28.4

The average direction of the wind, total velocity, the rainfall, and number of clear, fair, and cloudy days, also number of days rain fell during the Spring season, from 1878 to 1884, will be found in the following tabulated statement:

SPRING OF—	Mean Spring Direction.	Velocity for Spring.	Rainfall for Spring.	Clear Days.	Fair Days.	Cloudy Days.	Days Rain Fell.
1878-----	S.	13.962	4.33	45	28	19	21
1879-----	S.E.	14.530	8.84	39	34	19	31
1880-----	S.E.	19.653	16.66	49	24	19	25
1881-----	S.	14.966	3.01	60	22	10	12
1882-----	N.	17.774	6.12	57	19	16	19
1883-----	S.	15.825	7.22	54	26	12	21
1884-----	S.W.	18.168	12.52	46	23	23	25
Totals-----		114.878	58.70	350	176	118	154
Averages-----	S.	16.411	8.386	50.0	25.1	16.9	22.1

The statistics following will be found to contain the mean direction of the wind, total velocity, the rainfall, the number of clear, fair, and cloudy days, also the number of days rain fell for the Summer season, from 1878 to 1884:

SUMMER OF—	Mean Summer Direction.	Velocity for Summer.	Rainfall for Summer.	Clear Days.	Fair Days.	Cloudy Days.	Days Rain Fell.
1878-----	S.	13.303	-----	83	9	-----	-----
1879-----	S.	13.645	.13	81	11	-----	3
1880-----	S.	16.066	Sprinkle	85	7	-----	2
1881-----	S.	16.531	.50	86	5	1	3
1882-----	S.	15.449	.10	87	4	1	3
1883-----	S.	15.609	-----	89	3	-----	-----
1884-----	S.	16.518	1.45	76	9	6	7
Totals-----		107.121	2.18	587	48	8	18
Averages-----	S.	15.303	0.311	83.9	6.9	1.1	2.6

The mean direction of the wind, the total velocity, the rainfall, and number of clear, fair, and cloudy days, also the number of days rain fell for the Fall season from 1878 to 1884, will be found recorded in the following table:

FALL OF—	Mean Fall Direction.	Velocity for Fall.	Rainfall for Fall.	Clear Days.	Fair Days.	Cloudy Days.	Days Rain Fell.
1878-----	N.	11.269	1.35	71	16	4	7
1879-----	S.	10.492	2.93	59	20	12	12
1880-----	N.	11.518	.05	71	14	6	2
1881-----	N.	12.993	2.73	73	15	3	11
1882-----	N.W.	12.213	6.42	61	22	8	15
1883-----	S.	10.771	2.48	67	18	6	11
1884-----	N. & S.E.	10.659	2.61	75	13	3	7
Totals-----		79.915	18.57	477	118	42	65
Averages----	N.	11.416	2.653	68.1	16.9	6.0	9.3

The tabulated statement below shows the number of times the wind was observed blowing from the different points of the compass for the Winter seasons from 1877-8 to 1883-4—three observations daily:

WINTER OF—	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1877-78-----	66	7	15	69	54	19	3	11	26
1878-79-----	102	4	5	41	41	18	4	11	44
1879-80-----	41	13	19	77	30	17	6	47	23
1880-81-----	50	5	7	107	57	15	2	19	8
1881-82-----	86	9	8	75	35	18	7	12	20
1882-83-----	54	8	16	66	33	14	9	60	9
1883-84-----	63	11	15	75	37	8	8	40	15
Total-----	462	57	85	510	287	109	39	200	145
Averages----	66.0	8.1	12.1	72.9	41.0	15.1	5.6	28.6	20.7

The following table shows the number of times the wind was observed blowing from the different points of the compass; also the number of calms observed during the Spring season, from 1878 to 1884, and is as follows from three daily observations:

SPRING OF—	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1878-----	30	2	3	48	89	54	11	23	16
1879-----	34	3	1	29	82	75	13	16	23
1880-----	31	4	6	61	59	60	6	45	4
1881-----	50	4	4	42	71	71	10	14	10
1882-----	71	0	1	52	56	55	7	21	13
1883-----	13	3	8	57	91	50	9	42	3
1884-----	29	2	7	51	70	75	11	27	3
Totals-----	258	18	30	340	518	440	67	188	72
Averages----	36.9	2.6	4.3	48.6	72.6	62.9	9.6	26.9	10.3

The wind's direction for the Summer months from 1878 to 1884 will be found to be as follows:

SUMMER OF—	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1878 -----	13	1	0	25	161	47	6	15	8
1879 -----	24	1	0	5	111	79	8	37	11
1880 -----	14	0	1	46	109	64	10	30	2
1881 -----	21	1	0	58	115	55	6	16	4
1882 -----	3	1	2	56	135	41	9	23	5
1883 -----	6	0	0	54	127	50	9	29	0
1884 -----	2	0	3	52	107	76	8	24	3
Totals ----	83	4	6	296	865	412	56	174	33
Averages--	11.9	0.6	0.9	42.3	123.6	58.9	8.0	24.9	4.7

The table following shows the direction of wind during the Fall months, from 1878 to 1884, both years included:

FALL OF—	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1877 -----	59	10	5	19	78	29	9	31	33
1878 -----	75	5	3	12	64	36	15	37	26
1879 -----	45	9	9	41	66	42	4	28	38
1880 -----	75	7	7	40	55	37	12	30	10
1881 -----	81	10	2	46	46	35	8	28	16
1882 -----	19	8	5	60	54	27	20	66	14
1883 -----	30	4	10	62	66	29	6	53	12
1884 -----	49	7	3	49	47	48	12	38	20
Totals ----	433	60	44	329	476	283	86	311	169
Averages--	54.1	7.5	5.5	41.1	59.5	35.4	10.8	38.9	21.1

The following data shows the number of times the wind was observed blowing from the different points of the compass, and also the number of calms occurring at the time of observations. The calculations are made from three daily observations, making 1,095 observations during each year, and 1,098 for 1881, and is as follows:

YEAR OF—	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1878 -----	194	11	12	151	364	155	36	84	88
1879 -----	165	18	14	140	306	220	29	104	100
1880 -----	162	24	33	239	259	172	34	147	30
1881 -----	217	24	12	232	280	176	30	72	51
1882 -----	167	14	21	251	276	145	43	140	37
1883 -----	102	17	37	243	322	138	31	173	29
1884 -----	149	18	22	220	267	213	38	132	36
Totals -----	1,156	126	151	1,476	2,074	1,219	241	852	371
Averages-----	165.1	18.0	21.4	210.9	296.3	174.1	34.4	121.7	53.0

The following table shows the total number of clear, fair, and cloudy days; also, the number of days in which rain fell for each year, from 1878 to 1884—both years included:

YEAR OF—	Clear Days.	Fair Days.	Cloudy Days.	Days on which Rain Fell.
1878-----	225	81	59	67
1879-----	223	96	46	69
1880-----	244	62	60	58
1881-----	233	68	64	69
1882-----	251	71	43	62
1883-----	260	77	26	46
1884-----	238	68	57	69
Totals -----	1,674	523	355	440
Averages -----	239.1	74.7	50.7	62.9



RECORDS OF RAINFALL.

INTERESTING DATA UPON THE SUBJECT FROM VARIOUS SECTIONS OF THE STATE,
COMPILED BY SERGEANT BARWICK, UNITED STATES SIGNAL CORPS.

The rainfall that was called for through Sacramento papers by Sergeant Barwick from all portions of the State some time ago has been in a measure quite successful, as he has received rainfall records from San Diego to Siskiyou Counties. The data received has been carefully compiled and averages calculated by the Sergeant, and ably assisted in his work by Lopez Maulding of this city. The tabulated matter will begin with San Diego County and come northward. The first table is from Poway, San Diego County, and covers a period from November, 1878, to December, 1884. The data was furnished by Adams Chapin of Poway, volunteer observer of the United States Signal Service:

RAINFALL AT POWAY, SAN DIEGO COUNTY.

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	For Season of	Total for Season.
1878											.02	1.57			
1879	2.88	1.50	none	1.30	.08	.20	none	none	none	.30	2.75	4.72	13.73	1879-80	15.61
1880	1.13	1.54	1.76	3.10	.09	none	.06	.16	none	.74	.30	3.56	12.44	1880-81	10.43
1881	1.16	.60	2.86	1.14	.03	none	none	.04	.03	1.17	.20	.73	7.96	1881-82	13.39
1882	6.40	2.69	1.13	.90	.04	.09	none	.01	.04	.29	.60	.27	12.46	1882-83	8.47
1883	.94	1.76	1.87	1.36	1.34	none	none	none	none	1.59	none	2.40	11.26	1883-84	29.45
1884	1.59	9.40	6.96	4.81	2.26	.44	none	none	none	.24	.38	5.91	31.99		
Totals	14.10	17.49	14.58	12.61	3.84	.73	.06	.21	.07	4.13	4.25	19.16	89.84		77.35
Averages	3.350	2.915	2.430	2.102	.640	.122	.010	.035	.012	.688	.607	2.737	14.973		13.470

SAN DIEGO, SAN DIEGO COUNTY.

The table for this most southerly station in California dates back to November 1, 1871, and includes to December 31, 1884. The figures are from the annual reports of the Chief Signal Officer. They show the rainfall by calendar years and seasonal years; also, the totals and averages by months:

Inches -----	Season of -----	Total for Year --	December -----	November -----	October -----	September -----	August -----	July -----	June -----	May -----	April -----	March -----	February -----	January -----	Year -----
1871			1.39	1.19	none	none	none	none	none	none	.12	.26	.46	1.63	.99
1872			1.41	.77	none	none	1.95	none	none	.01	.10	.11	4.15	.34	1872
1873			5.46	.55	none	.04	.53	.12	none	.32	.35	1.20	3.73	3.11	1873
1874			10.83	.41	none	.39	.21	.02	none	.20	.12	.45	.37	2.38	1874
1875			6.80	.15	none	.08	.06	.03	.05	.05	.06	1.78	2.44	2.47	1875
1876			7.24	.89	.06	.81	.06	none	none	.43	.26	1.44	.23	1.05	1876
1877			8.17	3.89	none	.96	none	none	none	.58	2.91	1.41	4.83	1.45	1877
1878			13.87	1.57	none	.29	none	none	none	sprin	.60	.10	1.04	3.54	1878
1879			14.71	6.30	none	.53	.28	.32	.05	.06	1.34	1.43	1.50	.61	1879
1880			10.37	4.15	none	.24	.12	.01	.05	.04	1.35	1.88	.45	.52	1880
1881			5.00	.30	none	.41	.39	none	.07	.18	.45	1.02	2.55	4.53	1881
1882			9.74	.13	none	2.01	.20	none	.08	1.14	.31	.41	.95	1.09	1882
1883			8.01	1.82	none	.07	none	none	.31	2.17	2.84	6.23	9.05	1.34	1883
1884			26.95	4.83	none										1884
Totals			32.36	9.06	5.86	.58	2.73	.24	.87	5.30	10.95	17.92	32.92	23.42	Totals
Av'ges			10.743	2.312	4.50	.045	.210	.018	.067	.408	.842	1.378	2.532	1.801	Av'ges

LOS ANGELES, LOS ANGELES COUNTY.

The table for Los Angeles is compiled from reports of the Chief Signal Officer, and covers the period from July 1, 1877, to December 31, 1884, and is a record of the rainfall by months, by calendar years, and seasonal years. It also shows totals and averages for each month from the date of opening the station to December 31, 1884:

Inches -----	Season of -----	Total for Year --	December -----	November -----	October -----	September -----	August -----	July -----	June -----	May -----	April -----	March -----	February -----	January -----	Year -----
1877			3.93	.45	.86	none	none	none	none	.07	1.71	2.57	7.68	3.33	1877
1878			4.70	none	.14	none	none	none	.03	.24	1.19	.49	.97	3.59	1878
1879			6.53	3.44	.93	none	none	none	none	.04	5.06	1.45	1.56	1.33	1879
1880			18.65	.67	.14	sprin	sprin	sprin	none	.01	1.66	.46	.36	1.43	1880
1881			5.53	.27	.82	sprin	sprin	none	none	.63	1.83	2.66	2.66	1.01	1881
1882			10.74	.08	.05	none	none	none	sprin	.03	.15	2.87	3.47	1.62	1882
1883			14.14	2.56	1.42	none	none	none	sprin	.39	3.58	12.36	13.37	3.15	1883
1884			40.37	4.65	.39	sprin	sprin	.02	1.39						1884
Totals			31.37	7.72	4.75	sprin	.02	.02	1.52	3.99	13.98	24.06	30.07	15.46	Totals
Av'ges			18.243	3.921	.594	sprin	.002	.002	.217	5.70	1.997	3.437	4.296	2.209	Av'ges

* Total for six months.

VISALIA, TULARE COUNTY.

The rainfall at Visalia, Tulare County, was taken from the United States Signal Service annual reports, and extends from July, 1877, to June 15, 1883, on which date the Signal Service station at that point was discontinued:

Year -----	January -----	February -----	March -----	April -----	May -----	June -----	July -----	August -----	September -----	October -----	November -----	December -----	Total for Year -----	Season of -----	Total for Season.
1877							none	none	none	none	.53	.83		1877-78	10.49
1878	3.25	3.98	1.13	.69	.08	none	none	none	none	.36	.10	.20	9.79	1878-79	3.95
1879	.70	.30	.53	1.23	.47	.06	none	none	none	.92	1.03	2.16	7.40	1879-80	12.81
1880	.98	3.14	.48	3.82	.28	none	sprin.	none	none	.13	.35	5.03	14.21	1880-81	11.70
1881	2.71	1.10	1.20	.86	.29	none	sprin.	.03	.09	.31	.52	.27	7.38	1881-82	6.73
1882	.87	1.86	1.47	.95	.37	.02	none	none	.21	1.31	.83	.15	8.04	1882-83	8.17
1883	.04	.54	2.48	1.79	.82										
Totals	8.55	10.92	7.29	9.34	2.31	.08	sprin.	.03	.30	3.03	3.36	8.64	46.82		53.85
Av'ges	1.425	1.820	1.215	1.557	.385	.013	sprin.	.005	.050	.505	.560	1.440	7.803		8.975

SALINAS, MONTEREY COUNTY.

The rainfall of Salinas, Monterey County, was furnished by Dr. E. K. Abbott, and extends from July, 1872, to December 31, 1884, showing the rainfall by months, years, and seasons; also the averages:

Year -----	January -----	February -----	March -----	April -----	May -----	June -----	July -----	August -----	September -----	October -----	November -----	December -----	Total for Year -----	Season of -----	Total for Season.
1872							none	none	.01	.02		6.80		1872-73	13.45
1873	3.40	2.40	.80	none	none	none	none	none	.10	.10	.20	4.25	11.25	1873-74	11.17
1874	3.42	none	2.15	.95	none	none	none	none	none	1.83	1.42	none	9.77	1874-75	8.59
1875	4.50	.15	.69	none	none	none	none	none	none	none	5.17	2.18	12.69	1875-76	21.59
1876	6.16	3.55	4.52	none	.01	none	.10	none	.05	1.04	.05	none	15.48	1876-77	4.74
1877	2.54	.16	.30	.10	.40	none	none	none	none	.12	1.00	2.39	7.01	1877-78	23.82
1878	7.05	8.77	2.57	1.92	none	none	none	none	.05	.60	.20	.35	21.51	1878-79	10.94
1879	2.42	2.81	1.85	1.69	.82	.15	none	none	none	1.05	1.08	2.28	14.15	1879-80	13.22
1880	1.65	1.16	1.64	3.90	.46	none	none	none	none	none	.57	5.56	14.94	1880-81	14.07
1881	3.32	2.32	1.26	.66	none	.38	none	none	.10	.28	.67	1.24	10.23	1881-82	12.93
1882	1.78	2.31	4.86	1.01	.49	.19	none	none	.38	1.43	.65	1.95	15.05	1882-83	11.79
1883	.91	.95	2.26	1.28	1.98	none	none	none	.19	1.19	.25	.90	9.91	1883-84	20.25
1884	1.71	4.49	5.09	3.05	.72	2.66	none	.18	.11	1.79	.28	4.46	24.54		
Totals	38.86	29.07	27.99	14.56	4.88	3.38	.10	.18	.99	9.45	11.56	32.36	166.53		166.56
Av'ges	3.238	2.422	2.332	1.213	.407	.282	.008	.015	.076	.724	.889	2.489	13.878		13.880

SAN FRANCISCO.

The rainfall from 1849 to 1875 in the following table was taken from the report of the State Agricultural Society for 1874, and was furnished to that society by Thomas Tennant. The rainfall from 1875 to date is compiled from the reports of the Chief Signal Officer:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Inches
1849					none	none	none	none	none	3.14	8.66	6.20			
1850	8.34	1.77	4.53	.46	none	none	none	none	.33	none	.92	1.05	17.40	1849-50	33.10
1851	.72	.54	1.94	1.23	.67	none	none	none	1.03	.21	2.12	7.10	15.56	1850-51	7.40
1852	.58	.14	6.68	.26	.32	none	none	none	none	.80	5.31	13.20	27.29	1851-52	18.44
1853	3.92	1.42	4.86	5.37	.35	none	none	none	.04	.46	.12	2.28	2.32	1852-53	35.26
1854	3.88	8.04	3.51	3.12	.02	.08	none	.01	.15	2.41	.34	.81	22.37	1853-54	23.87
1855	3.67	4.77	4.64	5.00	1.88	none	none	none	none	none	.67	5.76	26.39	1854-55	23.68
1856	9.40	.50	1.60	2.94	.76	.03	.02	none	.07	.45	2.79	3.75	22.31	1855-56	21.66
1857	2.45	8.59	1.62	none	.02	.12	none	.05	none	.93	3.01	4.14	20.93	1856-57	19.88
1858	4.36	1.83	5.55	1.55	.34	.05	.05	.16	none	2.74	.69	6.14	23.46	1857-58	21.81
1859	1.28	6.32	3.02	.27	1.55	none	none	.02	.03	.05	7.28	1.57	21.39	1858-59	22.22
1860	1.64	1.60	3.99	3.14	2.86	.09	.21	none	none	.19	.58	6.16	20.46	1859-60	22.27
1861	2.47	3.72	4.08	.51	1.00	.08	none	none	.02	none	4.10	9.54	25.52	1860-61	19.00
1862	24.36	7.53	2.20	.73	.74	.05	none	none	none	.40	.15	2.35	38.51	1861-62	49.27
1863	3.63	3.19	2.06	1.04	.26	none	none	none	.03	none	2.55	1.80	14.56	1862-63	13.08
1864	1.83	none	1.52	1.57	.78	none	none	.21	.01	.13	6.68	8.91	21.64	1863-64	10.08
1865	5.14	1.34	.74	.94	.63	none	none	none	.24	.26	4.19	.58	14.06	1864-65	24.73
1866	10.88	2.12	3.04	.12	1.46	.04	none	none	.11	none	3.35	15.16	36.28	1865-66	22.93
1867	5.16	7.20	1.58	2.36	none	none	none	none	.04	.20	3.41	10.69	30.64	1866-67	34.92
1868	9.50	6.13	6.30	2.31	.03	.23	none	none	none	.15	1.18	4.34	30.17	1867-68	38.84
1869	6.35	3.90	3.14	2.19	.08	.02	none	none	.12	1.29	1.19	4.31	22.59	1868-69	21.35
1870	3.89	4.78	2.00	1.53	.20	none	none	none	.03	none	.43	3.38	16.24	1869-70	19.31
1871	3.07	3.76	1.29	1.93	.21	none	none	none	.03	.11	3.72	16.74	30.86	1870-71	14.10
1872	4.22	6.97	1.64	1.10	.16	.02	none	none	.14	.21	2.62	7.25	24.33	1871-72	34.71
1873	2.17	4.24	.78	.52	.01	.08	.03	.15	none	.68	1.31	10.12	20.09	1872-73	18.02
1874	4.85	1.83	3.55	1.04	.34	.08	none	none	.83	2.73	5.92	.28	21.45	1873-74	23.98
1875	6.97	.20	1.08	.02	.11	1.01	none	none	none	.24	7.27	4.15	21.05	1874-75	19.15
1876	7.55	4.92	5.49	1.29	.24	.04	.01	.01	.38	3.36	.25	none	23.54	1875-76	31.21
1877	4.32	1.18	1.08	.26	.18	.01	.02	none	none	.65	1.57	2.66	11.93	1876-77	11.04
1878	11.97	12.52	4.56	1.06	.16	.01	.01	none	.55	1.27	.57	.58	33.26	1877-78	35.17
1879	3.52	4.90	8.75	1.89	2.35	.05	.01	.02	sprin	.78	4.03	4.46	30.76	1878-79	24.46
1880	2.23	1.87	2.08	10.06	1.12	none	none	none	none	.05	.33	12.33	30.07	1879-80	26.63
1881	8.69	4.64	.90	2.00	.22	.69	none	none	.25	.54	1.94	3.85	23.72	1880-81	29.86
1882	1.68	2.96	3.45	1.22	.21	.04	none	none	.26	2.66	4.18	2.01	18.67	1881-82	16.14
1883	1.92	1.04	3.01	1.51	3.52	.01	none	none	.42	1.48	1.60	.92	15.43	1882-83	20.12
1884	3.94	6.65	8.24	6.33	.23	2.57	sprin	.04	.33	2.55	.26	7.68	38.82	1883-84	32.42
Totals	180.45	133.11	114.50	66.87	23.04	5.40	.36	.71	5.86	30.78	97.45	192.26	832.89	-----	840.11
Av'ges	5.156	3.803	3.271	1.911	.658	.154	.010	.020	.162	.855	2.709	5.340	23.797	-----	24.003

OAKLAND, ALAMEDA COUNTY.

The rainfall record below was taken by Mr. James Hutchison, of the Bay Nursery, Oakland, and furnished to Sergeant Barwick by Dr. J. B. Trembley, of Oakland. It shows the rainfall by months, by years, and by seasons, along with the monthly totals and averages for eleven years, extending from October, 1873, to December, 1884:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1873										.60	.60	10.18			
1874	5.60	1.80	5.25	1.25	.75	none	none	none	none	2.34	9.18	.31	26.48	1873-74	26.03
1875	6.15	.30	1.65	none	.10	1.64	none	none	none	.30	7.83	4.10	22.07	1874-75	21.67
1876	5.28	4.87	4.55	.93	.45	.24	.10	none	.15	4.74	.25	none	21.56	1875-76	28.55
1877	4.19	1.42	4.96	.22	.33	none	.18	none	none	.45	1.62	1.75	11.12	1876-77	12.36
1878	10.82	11.63	4.30	1.18	.40	none	none	none	.57	1.85	.65	.31	31.71	1877-78	32.33
1879	3.84	5.65	7.96	1.17	1.39	.16	none	none	none	.70	2.98	5.06	28.91	1878-79	23.55
1880	1.71	2.19	1.70	8.46	1.04	none	none	none	none	.05	.35	12.57	28.07	1879-80	23.84
1881	10.48	3.95	.88	1.40	.50	1.16	none	none	.40	.82	1.49	5.09	26.17	1880-81	31.34
1882	2.42	2.05	4.20	1.51	.15	none	none	none	.42	2.65	4.33	1.14	18.87	1881-82	18.13
1883	1.95	.70	3.33	2.20	3.50	none	none	none	1.00	1.03	.90	1.15	15.76	1882-83	20.22
1884	3.81	5.25	8.59	5.79	.55	3.03	none	.25	.35	2.80	.05	7.73	38.20	1883-84	31.10
Totals	56.25	39.81	43.37	24.11	9.16	6.23	.28	.25	2.89	18.33	30.23	49.39	268.92		269.12
Av'ges	5.114	3.619	3.943	2.192	.833	.566	.025	.023	.263	1.666	2.748	4.490	24.447		24.465

SACRAMENTO, SACRAMENTO COUNTY.

The following important table of rainfall at Sacramento, from September, 1849, to December 31, 1884, has been in the main published heretofore, but is now extended to include December 31, 1884, thus covering a period of thirty-five years and four months. It was collated from the records of Dr. T. M. Logan, Dr. F. W. Hatch, and those of the United States Signal Service office:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Inches
1849									.25	1.50	2.25	12.50		1849-50	36.00
1850	4.50	.50	10.00	4.25	.25	none	none	none	none	none	sprin	sprin	19.50	1850-51	4.71
1851	.65	.35	1.88	1.14	.69	none	none	none	1.00	.18	2.14	7.07	15.10	1851-52	17.98
1852	.58	.12	6.40	.19	.30	none	none	none	sprin	none	6.00	13.41	27.00	1852-53	36.36
1853	3.00	2.00	7.00	3.50	1.45	sprin	sprin	none	sprin	sprin	1.50	1.54	19.99	1853-54	20.06
1854	3.25	8.50	3.25	1.50	.21	.31	none	sprin	sprin	1.01	.65	1.15	19.83	1854-55	18.62
1855	2.67	3.46	4.20	4.32	1.15	.01	none	none	sprin	none	.75	2.00	18.56	1855-56	13.76
1856	4.92	.69	1.40	2.13	1.84	.03	none	none	sprin	.20	.65	2.40	14.26	1856-57	10.46
1857	1.38	4.80	.68	sprin	sprin	.35	none	sprin	none	.66	2.41	2.63	12.91	1857-58	15.00
1858	2.44	2.46	2.88	1.21	.20	.10	.01	sprin	sprin	3.01	.15	4.34	16.80	1858-59	16.03
1859	.96	3.91	1.64	.98	1.04	none	none	none	.02	none	6.48	1.83	16.86	1859-60	22.09
1860	2.31	.93	5.11	2.87	2.49	.02	.63	none	.06	.91	1.8	4.28	19.19	1860-61	16.10
1861	2.67	2.92	3.32	.48	.59	.14	.55	none	none	sprin	2.17	8.64	21.38	1861-62	35.56
1862	15.04	4.26	2.80	.82	1.81	.01	none	.01	none	.36	sprin	2.33	27.44	1862-63	11.58
1863	1.73	2.75	2.36	1.69	.36	none	none	none	sprin	none	1.49	1.82	12.20	1863-64	7.87
1864	1.08	.19	1.30	1.08	.74	.09	none	.08	sprin	.12	6.72	7.87	19.27	1864-65	22.51
1865	4.78	.71	.48	1.37	.46	none	sprin	none	.08	.48	2.43	.36	11.15	1865-66	17.93
1866	7.70	2.01	2.02	.48	2.25	.10	.02	none	none	sprin	2.43	9.51	26.52	1866-67	25.30
1867	3.44	7.10	1.01	1.80	.01	none	none	none	.01	none	3.81	12.85	30.03	1867-68	32.79
1868	6.04	3.15	4.35	2.31	.27	sprin	none	none	none	none	.77	2.61	19.50	1868-69	16.64
1869	4.79	3.63	2.94	1.24	.65	.01	none	none	sprin	2.12	.85	1.96	18.19	1869-70	13.57
1870	1.37	3.24	1.64	2.12	.27	sprin	sprin	sprin	none	.02	.58	.97	10.21	1870-71	8.47
1871	2.08	1.92	.69	1.45	.76	sprin	none	none	sprin	.21	1.22	10.59	18.92	1871-72	23.65
1872	4.04	4.74	1.94	.61	.28	.02	none	none	sprin	.22	1.93	5.39	19.17	1872-73	14.21
1873	1.23	4.36	.55	.51	none	sprin	.02	sprin	none	.31	1.21	10.01	18.20	1873-74	22.90
1874	5.20	1.86	3.05	.89	.37	sprin	sprin	none	.05	2.26	3.80	.44	17.92	1874-75	17.70
1875	8.70	.55	.80	sprin	sprin	1.10	none	none	none	.44	6.20	5.52	23.31	1875-76	26.53
1876	4.99	3.75	4.15	1.10	.15	none	.21	.02	sprin	3.45	.30	none	18.12	1876-77	8.96
1877	2.77	1.04	.56	.19	.64	.01	sprin	sprin	none	.73	1.07	1.43	8.44	1877-78	24.86
1878	9.26	8.04	3.09	1.07	.17	none	none	none	.29	.55	.51	.47	23.45	1878-79	17.85
1879	3.18	3.88	4.88	2.66	1.30	.13	sprin	sprin	none	.88	2.05	3.41	22.37	1879-80	26.47
1880	1.64	1.83	1.70	14.20	.76	none	sprin	none	none	.05	11.81	31.99	1880-81	26.57	
1881	6.14	5.06	1.37	1.64	sprin	.50	sprin	none	.30	.55	1.88	3.27	20.71	1881-82	16.51
1882	1.89	2.40	3.78	1.99	.35	.10	sprin	none	.57	2.63	3.22	1.13	18.06	1882-83	18.11
1883	2.23	1.11	3.70	.67	2.85	none	none	none	.90	.97	.61	.44	13.48	1883-84	24.78
1884	3.43	4.46	8.14	4.32	.06	1.45	none	sprin	.60	2.01	none	10.45	34.92	1884-85	-----
Totals	132.08	102.68	105.06	66.78	25.72	4.48	1.14	.11	4.13	25.78	68.46	166.40	685.95	-----	688.49
Av'ges, 35 years	3.774	2.934	3.002	1.908	.735	.128	.032	.003	*.115	*.716	*1.902	*4.622	19.599	-----	19.671

* Mean for thirty-six years. All others for thirty-five years.

RAINFALL AT FOLSOM, SACRAMENTO COUNTY.

The rainfall data tabulated below is from Folsom, Sacramento County, and was furnished Sergeant Barwick by J. H. Sturgis, volunteer observer of the United States Signal Service at that point. The rainfall is from September, 1871, to December, 1884, showing the totals, averages, yearly and seasonal averages for the past thirteen years:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1871									spring	.55	1.95	13.12		1871-72	28.82
1872	5.50	4.72	1.60	.63	.75	spring	none	spring	spring	.25	2.80	6.53	22.78	1872-73	15.70
1873	1.64	4.05	.34	.05	.03	none	.01	spring	spring	spring	1.39	10.51	18.02	1873-74	24.45
1874	5.26	2.63	1.82	2.03	.81	spring	spring	none	spring	1.66	5.19	.13	19.53	1874-75	15.70
1875	6.14	.04	1.24	spring	.07	1.23	none	none	none	.26	7.12	4.49	20.59	1875-76	30.53
1876	5.89	4.06	6.62	1.56	.24	spring	.26	.03	none	3.76	.25	none	22.38	1876-77	9.90
1877	3.38	.68	.81	spring	1.02	spring	spring	spring	none	.75	.54	1.34	8.52	1877-78	25.00
1878	8.41	8.37	4.23	1.10	.26	none	none	spring	.12	.43	.62	.56	24.10	1878-79	21.91
1879	4.87	4.94	5.43	3.38	1.44	.12	none	spring	none	1.21	2.20	3.19	26.78	1879-80	25.09
1880	1.51	2.13	1.40	11.39	2.06	none	spring	none	none	spring	.10	9.85	28.44	1880-81	25.91
1881	6.70	6.07	1.38	1.13	spring	.68	none	none	.40	1.21	1.57	3.45	22.59	1881-82	18.28
1882	2.38	3.01	3.82	2.51	.27	.06	spring	none	.68	2.81	3.95	.74	20.23	1882-83	22.32
1883	2.11	.80	5.46	1.10	4.57	none	none	none	1.82	1.41	.81	.92	19.00	1883-84	31.02
1884	3.88	5.92	8.14	5.32	1.16	1.64	none	spring	.64	2.02	none	9.13	37.85	-----	-----
Totals	57.67	47.42	42.29	30.20	12.68	3.73	.27	.03	3.66	16.32	28.49	63.96	290.81	-----	294.63
Averages	4.436	3.648	3.253	2.323	.975	.287	.021	.002	.261	1.166	2.035	4.569	20.772	-----	22.664

SHINGLE SPRINGS, EL DORADO COUNTY.

The following rainfall tables were compiled by Sergeant Barwick from data furnished him by Mrs. J. Carney, of Carson City, Nevada. The observations of rainfall were taken by her father, Doctor J. R. Edwards, an old pioneer citizen of Sacramento County; 1849 and 1850 were taken at Mormon Island, Sacramento County; the remaining years the rainfall was taken about two miles from Shingle Springs, El Dorado County, and cover a period of eighteen years for that point; and two years at Mormon Island. This gives El Dorado County a good rainfall record. This table, from 1850 to 1868, and Samuel Hale's, of Placerville, from 1874 to 1884, makes nearly twenty-eight years of rainfall records for that county:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1849										.08	5.65	10.40		1849-50	39.25
1850	13.70	2.15	6.80	.45	.02	none	none	sprin	1.23	.10	.65	2.70	27.80	1850-51	17.26
1851	4.80	.40	2.10	4.80	.40	none	none	sprin	.40	.30	2.45	7.80	23.45	1851-52	32.50
1852	3.20	.50	9.60	7.25	1.00	none	none	none	none	.50	7.20	11.40	40.65	1852-53	47.57
1853	13.70	2.40	8.20	3.00	1.10	.05	none	sprin	1.20	.75	6.40	4.10	40.90	1853-54	30.15
1854	4.40	3.40	4.30	5.40	.20	.30	none	none	none	3.72	2.70	3.50	27.92	1854-55	19.50
1855	3.20	1.10	2.50	2.10	.68	none	none	none	.70	none	2.40	5.70	18.34	1855-56	18.60
1856	4.10	.80	3.40	1.20	.20	.10	none	none	none	none	2.15	7.35	19.30	1856-57	26.11
1857	6.50	7.05	1.94	none	.42	.35	.35	none	none	.42	4.94	1.99	23.96	1857-58	19.91
1858	2.37	2.69	4.00	1.70	.20	.60	none	none	none	3.25	.50	6.20	21.51	1858-59	31.41
1859	1.22	12.00	5.81	1.82	1.51	none	none	none	none	.15	11.16	2.40	36.07	1859-60	28.09
1860	2.20	1.15	4.71	3.40	2.10	.02	.80	none	none	1.20	.50	7.43	23.51	1860-61	26.25
1861	3.78	4.60	8.34	.20	.15	.05	none	none	none	none	6.90	11.22	35.44	1861-62	77.80
1862	34.13	6.75	6.90	3.34	4.10	1.90	2.56	none	none	.78	.37	2.84	63.67	1862-63	19.27
1863	1.45	4.96	4.01	2.76	2.10	none	none	none	none	none	2.05	6.30	23.63	1863-64	24.27
1864	7.29	3.21	.63	3.94	.85	none	none	none	none	.08	9.94	9.13	35.07	1864-65	34.44
1865	5.13	5.63	1.13	2.49	.89	none	none	none	none	.45	6.84	2.57	25.13	1865-66	36.86
1866	11.08	3.46	6.21	1.31	4.88	.18	none	none	none	none	4.73	18.77	50.62	1866-67	50.30
1867	9.17	7.51	4.09	6.01	.02	none	none	sprin	.82	2.24	7.17	23.76	60.81	1867-68	-----
1868	12.12	3.70	14.39												
Totals	143.54	73.46	99.06	51.17	20.82	3.55	3.71	sprin	4.35	14.02	84.70	145.56	597.78	-----	579.54
Av'ges	7.555	3.866	5.214	2.843	1.166	.197	.206	sprin	.242	.738	4.458	7.661	33.210	-----	32.195

PLACERVILLE, EL DORADO COUNTY.

The rainfall record at Placerville, El Dorado County, was furnished Sergeant Barwick by Samuel Hale, Superintendent of the El Dorado Water and Deep Gravel Mining Company, and covers a period of six years, from 1879 to 1884. Records were also kept from February, 1874, to February, 1877. The total for each year was, for eleven months in 1874, 33.23 inches; 1875, 44.84 inches; 1876, 39.21 inches; January and February, 1877, gave 11.05 inches:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1879										3.47	5.28	7.53	16.28	1879-80	52.60
1880	4.38	5.81	4.66	17.52	3.95	none	none	none	none	.35	.58	16.94	54.19	1880-81	48.04
1881	15.53	7.01	3.38	2.36	sprin	1.80	sprin	none	1.08	2.80	2.87	7.70	44.62	1881-82	42.46
1882	6.71	5.15	9.30	5.53	1.19	.13	sprin	none	.93	5.72	4.94	1.98	41.58	1882-83	36.56
1883	3.74	2.58	6.88	3.54	6.25	none	sprin	none	1.67	3.38	1.67	2.63	32.34	1883-84	57.39
1884	6.06	11.56	14.46	11.82	1.60	2.51	sprin	.03	.85	2.47	.10	22.65	74.12		
Totals	36.42	32.11	38.68	40.77	12.99	4.53	sprin	.03	4.53	18.19	15.44	59.43	263.13		237.05
Avg'es	7.284	6.422	7.736	8.154	2.598	.906	sprin	.006	.906	3.032	2.573	9.905	43.855		47.410

GEORGETOWN, EL DORADO COUNTY.

The rainfall at Georgetown, El Dorado County, was furnished by C. M. Fitzgerald, of the California Water and Mining Company, and extends from November, 1872, to December, 1884. The table shows the monthly and annual rainfall, also total amounts for each season from 1872-73 to 1883-84, with the monthly averages, and also averages for the year and season. This makes El Dorado County the best represented in its rainfall of any county in the State, viz.: Shingle Springs, Placerville, and Georgetown:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1872											4.30	18.72			
1873	4.08	13.05	3.05	3.11	.12	none	.03	none	none	.61	.55	16.60	41.20	1872-73	46.46
1874	16.66	8.03	13.87	5.80	1.32	.20	none	none	none	3.86	14.60	1.24	65.58	1873-74	63.64
1875	17.87	.04	5.07	.31	2.03	2.06	none	none	none	1.90	24.12	10.85	64.25	1874-75	47.08
1876	13.09	9.97	14.54	4.78	1.22	none	.77	none	none	11.47	.80	none	56.64	1875-76	81.24
1877	12.44	2.14	7.78	1.74	3.87	.24	none	none	none	1.03	4.30	1.97	35.51	1876-77	40.48
1878	16.21	22.78	10.92	2.99	.99	.12	none	none	.66	2.56	2.66	.48	60.37	1877-78	61.31
1879	11.24	12.41	17.57	9.65	3.39	.34	none	none	none	3.85	6.25	11.73	76.43	1878-79	60.96
1880	5.47	6.00	5.50	25.63	5.97	none	none	none	none	.18	.37	22.67	71.79	1879-80	70.40
1881	20.83	12.85	3.84	2.40	.40	2.28	none	none	2.02	4.23	3.30	10.32	62.47	1880-81	65.82
1882	8.59	5.88	10.44	7.11	2.06	.18	none	none	.16	7.75	7.00	3.31	52.48	1881-82	54.13
1883	4.70	3.08	8.73	3.87	7.34	none	none	none	1.60	4.10	1.94	3.50	38.86	1882-83	45.94
1884	7.53	13.80	19.94	15.07	1.52	3.65	none	.01	.80	3.54	.03	33.73	99.62	1883-84	72.66
Totals	138.71	110.03	121.25	82.46	30.23	9.07	.80	.01	.524	45.08	70.22	135.12	725.20		710.12
Avg'es	11.559	9.169	10.104	6.872	2.519	.756	.067	.0008	.437	3.757	5.402	10.394	60.433		59.177

GRASS VALLEY, NEVADA COUNTY.

The rainfall that goes to make up the following table for Nevada County was taken at Grass Valley by Mr. Loutzenheiser, and forwarded to Sergeant Barwick by the Grass Valley *Daily Tidings*. It covers a period of eleven years, from 1873 to 1884:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1873	4.01	12.50	1.39	2.32	2.56	none	none	none	none	.83	2.99	19.01	45.61	1872-73	40.00
1874	13.71	6.93	11.71	3.76	1.05	.10	none	none	none	2.95	15.91	1.08	57.20	1873-74	60.09
1875	15.56	1.39	4.14	.29	1.18	2.28	none	none	none	.97	16.99	7.44	50.24	1874-75	44.78
1876	12.01	10.75	12.47	2.80	1.23	.65	none	none	.06	8.72	.62	none	49.31	1875-76	65.31
1877	10.18	2.44	4.79	1.14	1.40	.74	none	none	none	1.21	3.78	1.74	27.42	1876-77	30.09
1878	15.74	17.76	10.18	2.78	.59	none	none	none	.68	2.09	2.54	.75	53.11	1877-78	53.78
1879	10.72	11.51	18.07	7.08	3.08	.30	none	.08	none	2.79	6.54	8.86	69.03	1878-79	56.82
1880	6.40	4.83	4.07	23.31	6.23	.09	none	none	none	.04	.30	22.69	67.96	1879-80	63.20
1881	19.20	8.50	3.33	1.85	.05	1.50	none	none	1.25	3.71	3.52	8.21	51.12	1880-81	57.46
1882	6.03	6.30	7.96	5.27	1.18	.50	none	none	1.88	7.88	4.78	2.83	44.61	1881-82	43.93
1883	8.05	2.97	9.25	2.38	5.77	none	none	none	1.44	3.03	1.48	2.31	31.68	1882-83	40.70
1884	7.80	10.27	13.98	10.98	1.00	2.30	none	none	.98	3.30	.05	28.39	79.05	1883-84	54.59
Totals	124.41	96.15	101.34	63.96	25.32	8.46	none	.08	6.29	37.52	59.50	103.31	626.34	-----	610.75
Av'ges	10.368	8.012	8.445	5.330	2.110	.705	none	.007	.524	3.127	4.958	8.699	52.195	-----	50.896

WEST BUTTE, SUTTER COUNTY.

The report of rainfall at West Butte, Sutter County, was furnished by A. S. Noyes, and covers a period of five years and two months, from November, 1879, to December, 1884, inclusive, and is as follows:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1879											2.38			1879-80	13.25
1880	.62	.75	.75	5.88	.62	none	none	none	none	none	none	5.38	14.00	1880-81	12.20
1881	3.69	1.38	.75	1.00	none	none	none	none	.31	1.12	.38	2.00	10.63	1881-82	12.26
1882	1.88	2.31	2.57	1.19	.50	none	none	none	.25	.88	2.62	.25	12.45	1882-83	12.44
1883	.75	.19	3.06	.88	3.56	none	none	none	.62	.81	none	.19	10.06	1883-84	19.80
1884	3.81	2.12	6.50	3.75	.25	1.75	none	none	.57	1.00	none	4.94	24.69	-----	-----
Totals	10.75	6.75	13.63	12.70	4.93	1.75	none	none	1.75	3.81	5.38	15.01	71.83	-----	69.95
Av'ges	2.150	1.350	2.722	2.540	.986	.350	none	none	.350	.762	.897	2.502	14.366	-----	13.990

MARYSVILLE, YUBA COUNTY.

The rainfall from Marysville only covers a period of two years, and was furnished the Signal Service Observer at Sacramento by J. S. Dallam, Special River Observer for the United States Signal Service at that point:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1882									.99	2.42	2.84	1.31		1882-83	20.12
1883	1.64	.61	3.72	.98	5.61	none	none	none	.53	1.29	.94	.54	15.86	1883-84	23.47
1884	3.93	3.84	6.04	4.14	.16	2.06	none	none	.48	2.32	.03	7.64	30.64		
Totals	5.57	4.45	9.72	5.12	5.77	2.06	none	none	2.00	6.03	3.81	9.49	46.50		43.59
Averages	2.785	2.225	4.860	2.56	2.885	1.03	none	none	.667	2.010	1.270	3.164	23.250		21.795

COLUSA, COLUSA COUNTY.

The rainfall, etc., from Colusa, Colusa County, was furnished by J. D. McNary, Special River Observer at that point. The table below gives the rainfall by seasons from 1872-73 to 1883-84, and by months only from 1881 to 1884:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	For Season of	Total for Season
1872														1872-73	33.46
1873														1873-74	11.28
1874														1874-75	19.02
1875														1875-76	19.79
1876														1876-77	9.20
1877														1877-78	33.34
1878														1878-79	13.98
1879														1879-80	19.21
1880														1880-81	16.96
1881	3.70	2.27	.60	1.42	.34	none	none	none	1.19	none	.43	2.51	12.46	1881-82	22.62
1882	1.51	2.56	2.50	1.27	.04	.65	none	none	.23	1.19	1.73	.09	12.37	1882-83	11.66
1883	1.07	.37	2.36	.79	2.23	none	none	none	.68	.68	.11	.10	9.39	1883-84	29.75
1884	4.82	2.30	5.70	2.97	.12	2.88	none	none	.59	1.06	none	5.30	25.74		
Totals	11.10	7.50	11.16	6.45	3.73	3.53	none	none	2.69	2.98	2.27	8.60	59.96		239.47
Averages	2.775	1.875	2.790	1.613	.933	.883	none	none	.672	.732	.568	.215	14.990		19.956

PRINCETON, COLUSA COUNTY.

The record of rainfall at Princeton, Colusa County, was furnished by David Bentley, volunteer observer of the Signal Service, United States Army, and covers a period of ten years, from 1875 to 1884, inclusive, as follows:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1875	4.30	.15	.30	none	.05	1.75	none	none	none	.75	1.95	1.85	11.10	1875-76	17.18
1876	2.53	4.40	3.50	1.05	.15	.05	.90	.05	.15	4.60	.40	none	12.80	1876-77	10.20
1877	1.65	1.75	.85	none	.20	.30	.30	none	none	.98	1.63	1.48	9.14	1877-78	27.12
1878	10.43	7.64	2.28	1.01	.65	none	none	1.02	.20	.50	.96	.13	24.82	1878-79	10.73
1879	1.83	1.71	2.44	1.61	1.10	.12	none	.13	none	.07	1.91	2.81	13.73	1879-80	13.27
1880	.95	.90	.95	4.93	.75	none	none	none	none	none	.10	6.85	15.43	1880-81	15.54
1881	4.30	1.78	.83	1.15	.10	.43	none	none	.60	.60	.22	2.51	12.52	1881-82	11.09
1882	1.21	2.54	1.53	1.08	.28	.52	none	none	.18	1.71	2.42	.62	12.09	1882-83	12.05
1883	.65	.23	2.35	1.07	2.82	none	none	none	.58	.64	.10	.14	8.58	1883-84	17.78
1884	4.03	2.35	5.06	2.71	.05	2.12	none	none	1.13	1.10	none	6.03	24.58	-----	-----
Totals	31.88	23.45	20.09	14.61	6.15	5.29	1.20	1.20	2.84	10.95	9.69	22.42	149.79	-----	134.96
Av'ges	3.188	2.345	2.009	1.461	.615	.529	.120	.120	.284	1.095	.969	2.242	14.979	-----	14.996

RED BLUFF, TEHAMA COUNTY.

This table is made up from the Signal Service records, and shows the total rainfall for each calendar year from 1878 to December 31, 1884, and the rainfall by seasons from 1877-78 to 1883-84; also, the rainfall for each month, and the totals for each month, along with the averages from the opening of the Signal Office on July 1, 1877, to date:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Inches
1877							.05	.03	none	1.35	3.13	3.98	*8.54	-----	-----
1878	20.71	16.66	4.16	2.21	.89	none	none	none	.42	1.56	1.66	.69	48.96	1877-78	53.09
1879	3.18	3.67	5.39	2.12	2.18	.30	.04	.28	spring	.48	6.05	9.95	33.64	1878-79	21.49
1880	2.01	1.66	1.70	7.05	1.04	none	none	none	none	.08	.14	12.85	26.53	1879-80	29.94
1881	9.40	2.79	.51	1.83	.79	.51	spring	none	1.07	1.61	.73	5.69	24.93	1880-81	28.90
1882	2.81	3.94	2.67	2.12	.33	.15	none	none	.49	2.80	5.07	1.44	21.82	1881-82	21.12
1883	.87	.39	2.60	1.96	2.96	none	none	none	1.04	2.68	.74	.52	13.76	1882-83	18.58
1884	3.55	2.21	7.81	4.31	.18	.97	none	none	.36	.90	.04	7.75	28.08	1883-84	24.01
Totals	42.53	31.32	24.84	21.60	8.37	1.93	.09	.31	3.38	11.46	17.56	42.87	206.26	-----	197.13
Av'ges	6.076	4.474	3.549	3.086	1.196	.276	.011	.044	.422	1.433	2.195	5.365	25.282	-----	28.161

* Total for six months.

REED'S RAILROAD CAMP, UPPER SACRAMENTO RIVER.

The following interesting rain data from Reed's Camp, on the Upper Sacramento River, shows that heavy annual rainfalls are a very usual occurrence at that point, according to the observations made by L. Aultenreith, and by him furnished to Sergeant Barwick. The table extends from January, 1880, to December, 1884, and shows the averages by months, years, and seasons. From 1882 to 1884, the record was kept at Dog Creek, near Reed's Camp:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1880	8.60	3.34	8.32	19.26	none	none	none	none	none	none	32.07	71.59		1880-81	95.46
1881	31.76	14.14	8.04	5.99	.80	2.66	none	none	2.17	7.16	5.65	8.00	86.37	1881-82	65.90
1882	5.07	15.37	13.01	4.11	5.28	none	.08	none	.10	9.20	8.14	3.94	64.30	1882-83	55.27
1883	1.00	none	14.46	8.49	9.94	none	none	none	none	6.18	1.10	4.24	45.41	1883-84	71.73
1884	15.57	4.55	13.44	16.55	2.73	7.12	.25	none	1.03	7.99	2.32	19.70	91.25		
Totals	62.00	37.40	57.27	54.40	18.75	9.78	.33	none	3.30	30.53	17.21	67.95	358.92		288.36
Av'ges	12.400	7.480	11.454	10.880	3.750	1.956	.066	none	.660	6.106	3.442	13.590	71.784		72.090

YREKA, SISKIYOU COUNTY.

The rainfall table for Yreka extends from April, 1872, to December, 1884, and was furnished Sergeant Barwick by Mr. L. Aultenreith, of Yreka. The record is from the rain gauge of the C. P. R. R. Co. The record shows the monthly annual and seasonal rainfalls, the averages for each month during a period of twelve and thirteen years; also, the average for twelve seasons:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1872				.24	.44	none	.14	none	.25	1.55	1.43	3.72		1872-73	11.90
1873	1.28	1.77	.40	none	.60	none	none	none	.44	.55	1.17	2.20	9.31	1873-74	12.77
1874	3.78	1.62	1.49	.74	.34	.44	none	none	none	1.29	2.16	none	11.86	1874-75	10.27
1875	4.35	1.19	1.23	.17	.51	.30	.07	none	none	3.34	5.29	6.07	21.52	1875-76	22.48
1876	2.00	1.93	2.07	.42	.65	.20	.32	.19	.90	3.05	.43	.25	12.42	1876-77	13.69
1877	1.20	3.24	1.48	.74	1.56	.65	.18	none	none	.20	3.64	.95	13.84	1877-78	19.30
1878	6.12	3.91	2.80	.37	.56	none	.35	.40	.45	.25	1.15	.45	16.81	1878-79	12.94
1879	1.53	1.41	3.96	1.56	1.42	.39	.22	15	none	.77	2.32	7.23	20.96	1879-80	17.35
1880	2.43	.61	1.20	2.23	.41	none	.15	none	none	.13	.10	2.42	9.68	1880-81	20.18
1881	11.78	2.58	.19	.48	none	1.65	.59	.26	.30	3.24	.68	1.60	23.35	1881-82	12.23
1882	1.81	1.96	.42	1.20	1.02	none	none	none	.90	1.88	1.89	2.09	13.17	1882-83	12.74
1883	1.38	.47	.53	1.26	1.76	none	.33	.25	.33	1.35	.66	2.95	11.27	1883-84	17.46
1884	2.10	1.20	2.44	1.41	1.40	1.78	1.33	.51	.33	none	.79	6.19	29.48		
Totals	39.76	20.89	18.21	11.72	10.67	5.41	3.68	1.76	3.90	17.60	21.71	36.13	183.67		183.31
Av'ges	3.313	1.741	1.518	.901	.821	.416	.283	.135	.300	1.354	1.670	2.779	15.306		15.276

SCOTT VALLEY, SISKIYOU COUNTY.

The rainfall for Scott Valley, Siskiyou County, was tabulated from data furnished by Mr. C. H. Pyle, Yreka; the observations having been taken by Mr. Isaac Letcomb, of Scott Valley. This table is val-

uable for the length of time it extends back. The observations began in August, 1859, and run to December, 1884, without a break or any missing data therefrom:

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year	Season of	Total for Season
1859								.50	.87	1.00	4.33	.75		1859-60	20.28
1860	2.59	1.25	4.12	.75	2.00	.50	1.62	.24	.49	2.22	2.00	5.74	23.52	1860-61	20.65
1861	1.12	2.50	2.50	3.00	.54	.30	none	none	none	.51	11.56	10.63	32.66	1861-62	40.96
1862	9.29	3.75	1.32	2.00	1.00	.80	.10	none	.02	.15	.12	1.90	20.45	1862-63	15.72
1863	4.75	1.75	2.45	2.00	.40	1.93	.25	.09	.40	.25	1.85	6.17	22.29	1863-64	15.60
1864	2.07	.43	.82	2.70	.51	.31	none	.63	.04	.31	6.00	12.75	26.57	1864-65	26.77
1865	1.87	2.40	1.30	.32	.05	.75	.35	.02	1.15	1.33	9.79	1.21	20.54	1865-66	35.65
1866	6.59	3.50	9.20	.02	1.72	.62	.50	.47	none	.08	2.51	11.75	36.96	1866-67	28.38
1867	9.12	2.02	.64	1.34	.44	.01	none	.26	.40	.88	1.75	9.68	26.54	1867-68	23.61
1868	3.06	1.50	3.70	1.14	.18	1.06	none	none	.06	.50	.77	2.80	14.77	1868-69	18.29
1869	5.76	1.13	1.32	3.61	1.52	.69	.13	none	1.00	.01	3.04	3.56	21.77	1869-70	19.87
1870	5.00	2.91	1.73	1.37	1.12	.13	none	none	.01	.02	1.00	3.50	16.79	1870-71	13.91
1871	1.86	2.47	1.62	2.27	.55	.26	.35	none	.37	.05	1.62	7.68	19.10	1871-72	22.87
1872	4.18	6.94	1.40	.34	.25	.03	.01	.01	.41	.16	2.67	3.38	19.78	1872-73	13.84
1873	1.33	3.00	1.05	1.50	.27	.03	.03	.05	.37	.94	1.71	4.49	14.77	1873-74	21.79
1874	6.38	1.80	3.65	1.55	.71	.13	.01	.09	none	1.55	4.33	.43	20.63	1874-75	13.09
1875	3.13	.17	1.79	.35	.75	.12	.38	.05	none	4.45	7.31	7.33	25.83	1875-76	31.09
1876	2.26	3.33	3.94	.71	1.19	.18	.34	1.00	1.02	3.75	.54	.01	18.27	1876-77	18.90
1877	1.71	4.23	3.10	1.23	1.48	.71	.12	.02	.01	.45	.67	1.62	15.35	1877-78	23.36
1878	9.72	6.53	3.74	.27	.20	.12	.01	.06	.36	2.81	2.16	1.14	27.12	1878-79	26.42
1879	3.25	3.54	8.39	2.66	1.40	.27	.38	.47	.11	.81	4.64	4.58	30.50	1879-80	33.30
1880	10.62	2.32	2.65	5.39	1.32	.02	.37	.07	none	.18	.32	6.76	30.02	1880-81	31.56
1881	13.95	6.53	.79	1.19	.17	1.04	.54	.04	.76	3.53	2.40	4.60	35.54	1881-82	30.03
1882	4.48	5.69	2.22	2.45	1.29	.08	2.49	none	1.44	2.86	2.72	3.75	29.47	1882-83	22.27
1883	2.58	1.51	1.11	3.25	2.65	none	.40	.63	.66	2.41	1.11	4.75	21.06	1883-84	27.63
1884	4.28	3.14	3.45	3.06	1.65	.87	1.62	.01	.60	1.04	.16	8.18	28.06	-----	-----
Totals	120.95	74.34	68.00	44.47	23.36	10.96	10.00	4.71	10.55	32.25	77.08	129.14	598.36	-----	595.84
Av'ges	4.838	2.974	2.720	1.779	.934	.438	.400	.181	.406	1.240	2.965	4.967	23.914	-----	23.834

The following table shows the rainfall by seasons—that is, the months that are considered the rainy ones—beginning with September of one year and ending with August the next year, and makes a brief summary of the rainfall at twenty-two different points in this State, extending from San Diego to Siskiyou, and from San Francisco to Georgetown. The table begins with the Scott Valley Station, Siskiyou County, the records extending from the season of 1859-60 to that of 1883-4; Yreka, Siskiyou County, from 1872-3 to 1883-4; Weaverville, Trinity County, from 1871-2 to 1883-4; Reed's Camp and Dog Creek, on the upper Sacramento River, from 1880-81 to 1883-4; Red Bluff, Tehama County, from 1877-8 to 1883-4; Princeton, Colusa County, from 1875-6 to 1883-4; Colusa, Colusa County, from 1872-3 to 1883-4; West Butte, Sutter County, from 1879-80 to 1883-4; Marysville, Yuba County, from 1882-3 to 1883-4; Grass Valley, Nevada County, from 1872-3 to 1883-4; Georgetown, El Dorado County, from 1872-3 to 1883-4; Placerville, El Dorado County, for 1874-5, 1875-6, and from 1879-80 to 1883-4; Shingle Springs, El Dorado County, from 1849-50 to 1866-7; Folsom City, Sacramento County, from 1871-2 to 1883-4; Sacramento, Sacramento County, from 1849-50 to 1883-4; Oakland, Alameda County, from 1873-4 to 1883-4; San Francisco, San Francisco County, from 1849-50 to 1883-4; Salinas, Monterey County, from 1872-3 to 1883-4; Visalia, Tulare County, from 1877-8 to 1882-3; Los Angeles, Los Angeles County, from 1877-8 to 1883-4; San Diego, San Diego County, from 1871-2 to 1883-4; Poway, San Diego County, from 1879-80 to 1883-4:



SEASON OF—	1849-50	1850-51	1851-52	1852-53	1853-54	1854-55	1855-56	1856-57	1857-58	1858-59	1859-60	1860-61	1861-62	1862-63	1863-64	1864-65	1865-66	1866-67	1867-68	1868-69	1869-70	1870-71	1871-72	1872-73	1873-74	1874-75	1875-76	1876-77	1877-78	1878-79	1879-80	1880-81	1881-82	1882-83	1883-84	Totals	Averages	
Scott Valley	—	—	—	—	—	—	—	—	—	20.28	20.65	20.61	40.96	15.72	15.60	26.77	35.65	28.38	23.61	18.29	19.87	22.87	54.81	11.90	12.77	13.09	31.09	18.90	23.36	35.42	30.30	31.56	30.03	22.27	27.63	585.84	23.84	
Yreka	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.276	39.342	
Weaverville	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	288.36	197.13	
Reed's Camp	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	298.36	197.13	
Red Bluff	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	134.96	17.78	
Princeton	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13.990	19.456	
Colusa	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	69.95	239.47	
West Butte	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21.795	50.896	
Marysville	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	610.75	710.12	
Grass Valley	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	46.46	63.04	
Georgetown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33.46	11.28	
Placerville	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	44.78	47.08	
Shingle Springs	39.25	17.26	32.50	47.57	30.15	19.50	18.60	26.11	19.91	31.41	28.09	26.25	77.80	19.27	34.44	24.27	36.86	50.30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.70	14.21
Folsom City	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28.82	23.65	
Sacramento	36.00	4.71	17.98	36.36	20.06	18.62	13.76	10.46	15.00	22.22	22.09	16.10	35.56	11.58	22.51	17.93	25.30	32.79	38.84	21.35	19.31	8.47	34.71	18.02	23.08	11.17	8.59	31.21	21.59	32.36	35.17	23.82	10.49	21.68	16.10	6.22	8.10	
Oakland	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13.45	13.45	
San Francisco	33.10	7.40	18.44	35.36	23.87	23.08	21.06	19.88	21.81	22.22	19.00	16.10	35.56	11.58	22.51	17.93	25.30	32.79	38.84	21.35	19.31	8.47	34.71	18.02	23.08	11.17	8.59	31.21	21.59	32.36	35.17	23.82	10.49	21.68	16.10	6.22	8.10	
Los Angeles	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15.06	15.06	
San Diego	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.75	5.75	
Poway	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9.99	9.99	
Averages	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

THE WEATHER.

DR. J. B. TREMBLEY ON THE METEOROLOGY OF OAKLAND.

Careful observations taken daily during the past year—Relative humidity—Barometrical pressure—Monthly meteorological synopsis—Synopsis of Oakland climate for nine years past—Table of comparative annual meteorology.

The following summary of the weather for 1884 was furnished Sergeant Barwick by Dr. Trembley, of Oakland:

Observations taken at 7 A. M., 2 P. M., and 9 P. M. of each day, by J. B. Trembley, M. D.; latitude, $37^{\circ} 48' 20''$ north; longitude, $122^{\circ} 15' 20''$ west; height of barometer above the sea, 24 feet.

BAROMETRICAL PRESSURE.

Table showing the mean, highest, and lowest monthly barometer; also, the monthly range. Barometer not corrected for elevation or temperature.

1884.	Mean Monthly Barometer.	Highest Observed Barometer for the Month.	Lowest Observed Barometer for the Month.	Range for the Month.
January -----	30.05	30.45	29.55	.90
February -----	30.00	30.36	29.36	1.00
March -----	29.88	30.20	29.50	.70
April -----	29.96	30.18	29.52	.66
May -----	29.93	30.05	29.78	.27
June -----	29.92	30.10	29.70	.40
July -----	29.88	30.04	29.82	.22
August -----	29.88	30.05	29.79	.26
September -----	29.96	30.05	29.70	.38
October -----	29.93	30.10	29.72	.38
November -----	29.99	30.10	29.72	.33
December -----	29.98	30.13	29.47	.66
Means -----	29.94	30.15	29.63	.51.33

BAROMETRICAL RECAPITULATION.

Mean barometer for the year -----	29.94
Maximum barometer for the year, January 1, 9 A. M. -----	30.45
Minimum barometer for the year, February 20, 2 P. M. -----	29.36
Highest monthly range for the year -----	1.00
Lowest monthly range for the year -----	.22
Yearly range -----	.88

TEMPERATURE.

Table showing the mean temperature of the months, warmest and coldest days; also, maximum and minimum temperature, the greatest and least daily variations, monthly and mean daily range.

1884.	Mean Temperature of the Month.	Mean Temperature of Warmest Days.	Mean Temperature of Coldest Days.	Maximum Temper- ature.	Minimum Temper- ature.	Greatest Daily Va- riation.	Least Daily Vari- ation.	Monthly Range of Temperature.	Mean Daily Range of Temperature.
January	47.04	53.33	41.66	60.00	31.00	26.00	2.00	29.00	11.64
February	48.33	57.66	36.00	73.00	28.00	26.00	1.00	45.00	12.65
March	53.17	59.66	45.33	67.00	38.00	23.00	1.00	29.00	10.77
April	54.27	59.66	47.33	70.00	43.00	20.00	1.00	27.00	11.30
May	59.33	64.66	56.00	81.00	48.00	29.00	5.00	33.00	11.90
June	60.80	63.33	57.66	73.00	54.00	17.00	4.00	19.00	7.50
July	63.40	72.66	59.33	88.00	55.00	27.00	4.00	33.00	13.74
August	61.47	66.00	59.00	78.00	54.00	20.00	5.00	24.00	11.22
September	59.40	65.33	56.66	76.00	47.00	26.00	6.00	29.00	12.76
October	56.42	62.64	52.66	75.00	41.00	28.00	3.00	34.00	13.00
November	55.41	60.33	51.00	70.00	42.00	30.00	5.00	25.00	13.16
December	51.25	59.00	41.33	63.00	30.00	21.00	1.00	33.00	9.64
Means	55.85	62.09	50.31	72.83	42.58	24.41	4.33	30.00	11.64

RECAPITULATION OF TEMPERATURE.

Mean temperature of the year	55.85
Mean temperature of the warmest day, July 10th	72.66
Mean temperature of the coldest day, February 11th	36.00
Maximum temperature for the year, July 10th, 2 p. m.	88.00
Minimum temperature for the year, February 12th, 7. a. m.	28.00
Greatest daily variation, November 4th	30.00
Least daily variation, March 9th	1.00
Greatest monthly range, February	45.00
Least monthly range, June	10.00
Average daily range for the year	11.64
Average monthly range for the year	30.00
Yearly range of temperature	60.00

SEASONS.

Mean temperature of Winter	47.38
Mean temperature of Spring	55.59
Mean temperature of Summer	61.89
Mean temperature of Autumn	57.07
Difference between the coldest and warmest of Spring months	6.16
Difference between the coldest and warmest of Summer months	2.60
Difference between the coldest and warmest of Autumn months	3.99
Difference between the coldest and warmest of Winter months	1.56
Difference between the coldest and warmest months of the year	16.63

RELATIVE HUMIDITY.

Table showing the relative humidity, precipitation, weather, and direction from which the wind blew, from January 1, 1884, to December 31, 1884, inclusive.

1884.	Mean Relative Humidity	Rainfall in Inches.	No. of Clear and Fair Days.	No. Cloudy Days.	No. Days in which Rain Fell.	No. Foggy Mornings.	No. of Mornings Overcast.	No. Mornings Frost.	Wind— 1,098 Observations.				
									S.W. & W.	N.W. & N.	N.E. & E.	S.E. & S.	Calms
January	83.82	3.81	18	13	9	6	0	12	12	17	17	13	34
February	84.5	5.25	19	10	10	2	2	8	17	10	21	10	29
March	83.89	8.59	20	11	16	1	1	3	36	12	4	18	23
April	83.84	5.79	21	9	10	0	3	0	31	15	0	19	25
May	82.56	.55	24	7	5	0	5	0	47	10	2	8	26
June	88.42	3.03	16	14	10	0	10	0	43	4	1	11	31
July	85.24	.00	26	5	2	0	14	0	52	4	0	10	27
August	87.23	.25	25	6	1	1	21	0	46	14	0	12	21
September	86.09	.35	25	5	2	2	10	0	38	10	2	14	26
October	86.93	2.80	23	8	4	5	5	0	20	13	3	6	51
November	90.60	.05	26	4	3	1	5	5	20	7	3	8	52
December	81.17	7.73	17	14	13	1	1	10	20	12	9	22	30
Means & sums.	35.39	38.20	260	106	85	19	77	38	382	128	62	151	375

RECAPITULATION OF RELATIVE HUMIDITY FOR THE YEAR 1884.

Mean relative humidity for the year	85.39
Highest relative humidity during the year	100.00
Lowest relative humidity during the year, December 8th, 2 P. M.	38.1
Greatest variation of humidity in twenty-four hours, September 27th	41.00
Least variation of humidity in twenty-four hours, December 23d	.3
Rainfall in inches during the calendar year	38.20
Rainfall in inches during the agricultural year—1883-84	31.10
Rainfall in inches since July 1, 1884 (Bay Nursery)	11.18
Number of clear and fair days	260
Number of cloudy days	106
Number of days in which rain fell	85
Number of foggy mornings	19
Number of mornings overcast	77
Number of mornings that frost was seen	38
Wind, direction from southwest and west	382
Wind, direction from northwest and north	128
Wind, direction from northeast and east	62
Wind, direction from southeast and south	151
Calms	375

The following will more particularly illustrate the climate of Oakland for the nine past years, as it regards the equability of seasons and the difference between the warmest and coldest:

Years.	Spring.	Summer.	Autumn.	Winter.	Difference.
1876	54.46	60.40	57.75	48.20	12.20
1877	55.18	61.17	57.67	50.39	10.78
1878	55.73	59.36	56.92	59.12	9.24
1879	56.16	60.07	56.73	49.57	10.50
1880	52.97	58.95	55.86	45.38	13.57
1881	56.35	60.27	54.78	51.10	9.17
1882	54.12	60.06	56.44	46.80	13.26
1883	54.63	61.16	54.25	46.20	19.26
1884	55.59	61.89	57.07	47.38	14.51
Means	55.02	60.67	56.38	48.35	12.37

Difference between the warmest and coldest means of the seasons for nine years, is 12.37.

MONTHLY METEOROLOGICAL SYNOPSIS FOR THE YEAR 1884.

January—Was a wintry month for this climate; chilly, cold, frosty mornings, with frequent storms of rain and hard showers. The usual phenomena attending changeable weather were very marked and extremes reached. The casual phenomena, more particularly marked, was the appearance of the "Pon's Comet," which had been so long looked for, was plainly seen on the evening of the fourteenth, in the southwestern horizon, at an altitude of about forty degrees. Astronomical science had predicted the return of this comet in January, 1884, after an absence of a little more than threescore years and ten. Its making its appearance as predicted was surely a triumph of science, and a great gratification to its votaries. As seen in Oakland, it appeared to the eye like a star of the second magnitude, indefinitely luminous. The tail looked several degrees in length, pointing towards the zenith, wider than the nucleus, seemingly made up of parallel rays, the center rays the longest, terminating in a sharp feathery point. Luminous sun-risings and sun-settings were quite frequent, and a number of them were gorgeous to behold. They were more brilliant after the cold frosty weather began to abate, and the barometer was marking very high in its readings; especially when the atmosphere was warming up a few days previous to the heavy rains that occurred from the twenty-fifth to the end of the month.

February—Like the preceding month, was decidedly wintry. On the seventh a light fall of sleet and snow fell at 3 o'clock A. M., which covered the foothills white with snow, and a few following days and nights were the coldest of Winter; mud froze in the streets sufficiently strong to hold up buggies and their occupants as they rode over this very unusual condition of the streets; water-pipes in some localities froze and burst. On the twelfth and thirteenth in shady places it froze all day; ice formed in shallow pools of water one inch in thickness; a gale of wind prevailed from the northeast, filling the air with dust, sand, and a disagreeable chilliness piercing and biting to those who were compelled to be out of doors. Rain began on the fourteenth, which modified the temperature of the atmosphere, and on the fifteenth the rain fell in very hard showers, with a barometer reading of 29.36. Luminous sunsets were seen a number of times during the extreme cold weather, and preceding the high winds and storms.

March—Very rainy all the month; showers or light rain nearly every day. On the twenty-fifth very hard showers early A. M., showery all day; at 4:45 o'clock P. M., quite a severe earthquake occurred, vibration from northeast to southwest; buildings trembled, windows and crockery rattled in some localities. At 9:25 o'clock P. M. a vivid flash of lightning came, followed in quick succession with a loud peal of thunder; rain and hail fell for a few minutes very hard; some telegraph poles in the city were struck by lightning, split from top to bottom and broken off; the City Hall fire-bell was rung by the electric fluid, as it played with the wires of the Fire Department.

April—A pleasant month, with a large rainfall and growing weather. An earthquake occurred on the seventeenth, at 9:40 o'clock P. M.; a low rumbling noise accompanied it, and a sudden jog from the northwest towards the southeast; no perceptible vibration was noticed. Another light shock of an earthquake occurred at 11:30 o'clock A. M. on the twentieth; no vibration.

May—Was very pleasant; light showers of rain occurred at different intervals. On the seventeenth through the day there were strong indications of a storm or shower of rain; in the evening heat lightning flashed and lighted up the northern and northwestern horizon for an hour or more with electrical flashes. At 9:30 o'clock p. m. quite a hard thunder shower prevailed. Rain fell so as to form pools of water which ran off in the street gutters. The storm resembled an eastern thunder shower for a short time, more than had been observed in Oakland during the whole period of observations—eight years. Lightning played and darted in every direction, low thunder muttered incessantly in the distance, and rain fell in great drops at each electrical discharge.

June—The month will long be remembered among meteorologists as one very interesting in the various meteorological phenomena manifested. On the third, from 10 A. M. to 1 P. M., one of the most brilliant and well defined solar halos that is seldom seen, was observed. It was one of twenty-two degrees in diameter, giving out the prismatic colors very bright and clear; the inner edge of the halo was red, and the colors, as they extended to the outer edge, was of the color of a well defined rainbow; inside of this circle there seemed to be no light from the sun; the whole inner portion was dark up to the sun's disc, which shown or passed some rays of light, as often seen during a thick haze in the western horizon at sunset. Outside of this circle, the light of the sun was greatly obscured, fading from the bright orange color of the outer ring of the halo, into a dark pea-green or olive color, which extended over the whole visible horizon, giving a shadowy appearance to all terrestrial objects, similar to that which prevails at a total eclipse of the sun. At 1:30 o'clock P. M., a strong wind blew from the west, which dissipated the icy particles high up in the atmosphere, and with it the halo disappeared. This remarkable halo prognosticated the weather for the following ten days, and as was said at the time of observing it: that the violence of wind and storms which it indicated, foretold such another as this State or locality had not experienced for many years. The result of the forecasting was well vindicated—as all that remember the storms of June, 1884, will attest. In the agricultural portions of the State the early mown hay was much injured, and a great portion destroyed for use. Early fruits were also injured, but later ones were correspondingly benefited, as well as late sown grain.

July—No unusual weather prevailed—the month was pleasant.

August—On the fourth a light shower of rain fell at five o'clock A. M., continuing with a drizzling rain until 1:30 o'clock P. M. The amount of rain which fell was the first that had fallen in Oakland, that was susceptible to measurement, during the month of August, in eleven years. This rain extended in showers to the valleys lying to the westward of the Diablo range of foothills and mountains. With exception of rather more high overcasts in the mornings than was usual, the month was quite pleasant.

September—A general storm prevailed over the whole northern and middle portions of the State in showers and drizzling rain. On the seventh and eighth, overcast quite frequent; weather pleasant. The month ending on the thirtieth with a solar halo from 8 to 9 A. M., a gale of wind 12:30 P. M., and a light shower 3 P. M. Evening, clear, cool, wind northwest.

October—On the twelfth, thirteenth, and fourteenth, a rain storm

prevailed, with greater or less violence, over the whole agricultural area of the State. The storm injured some varieties of the grape crop very much, otherwise no injury was done.

November—Rather a pleasant month; no unusual meteorological phenomena; very light, drizzling rain and mists occurred several times with a few frosty mornings towards the last.

December—Was a regular Winter month for this State; frosty mornings; low and high fogs; high winds and gales; severe and continuous rain storms for days in duration. On the twenty-fifth low rumbling sounds of thunder were heard several times. Luminous and gorgeous sunsets and sunrises were observed several evenings, and that which occurred on the morning of the fifteenth was grand indeed; the whole horizon was lighted up with a reddened glow, tinting every cloud with ethereal paint.

TABLE SHOWING THE COMPARATIVE ANNUAL METEOROLOGY OF 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, AND 1884.

	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.
Mean temperature of the year.....	55.09	56.29	55.28	55.11	53.69	55.62	54.49	51.66	55.85
Mean temperature of warmest day.....	74.00	76.00	69.33	75.33	70.66	70.00	69.33	84.66	72.66
Mean temperature of coldest day.....	36.00	41.63	37.00	33.66	41.00	42.00	35.00	32.33	36.00
Maximum temperature for the year.....	97.00	96.00	84.00	93.00	89.00	87.00	84.00	103.00	88.00
Minimum temperature for the year.....	30.00	30.00	27.00	27.00	29.00	31.00	30.00	25.00	28.00
Greatest daily variation of temperature.....	33.00	38.00	33.00	46.00	36.00	35.00	11.00	38.00	30.00
Least daily variation of temperature.....	2.00	1.00	2.00	-----	1.00	1.00	1.00	1.00	1.00
Greatest monthly range of temperature.....	49.00	47.00	46.00	46.00	48.00	40.00	42.00	50.00	45.00
Least monthly range of temperature.....	19.00	25.00	23.00	30.00	28.00	21.00	19.00	29.00	19.00
Average daily range of temperature for year.....	14.94	14.61	13.65	12.96	14.10	13.40	12.80	12.81	11.64
Average monthly range of temperature for year.....	34.92	35.5	32.5	38.00	34.91	32.00	31.16	37.58	30.00
Yearly range of temperature.....	67.00	66.00	57.00	66.00	60.00	56.00	54.00	65.00	60.00
Mean relative humidity for year.....	83.00	83.11	84.71	85.29	83.70	83.25	82.57	83.71	85.39
Highest relative humidity for year.....	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Lowest relative humidity for year.....	40.00	34.40	38.60	39.00	27.00	29.00	28.7	33.9	38.1
Greatest variation humidity in 24 hours.....	49.09	51.20	45.06	58.00	54.40	37.40	65.7	48.8	31.00
Least variation humidity in 24 hours.....	.06	.01	.02	.30	.20	.30	.4	.3	.3
Rainfall in inches during the year.....	21.56	11.09	31.71	28.91	28.07	26.07	18.87	15.76	38.20
Rainfall in inches in agricultural years from July 1, 1876, to July 1, 1884.....	28.53	12.33	32.32	23.55	23.84	31.24	18.03	20.22	31.10
Number of clear and fair days during year.....	268	301	255	266	258	276	276	266	260
Number of cloudy days during year.....	98	64	110	99	108	89	89	99	106
Number of days in which rain fell.....	63	58	78	89	53	67	72	53	85
Number of foggy mornings.....	23	8	17	19	27	28	15	21	19
Number of mornings overcast.....	51	44	64	63	86	52	77	105	77
Number of mornings that frost was seen.....	35	35	36	46	62	47	50	58	38
Wind, direction from S.W. and W.....	342	364	311	355	346	402	345	428	382
Wind, direction from N.W. and W.....	210	150	173	150	136	136	150	119	128
Wind, direction from N.E. and N.....	34	63	45	50	59	58	53	29	62
Wind, direction from S.E. and S.....	163	150	164	126	172	138	143	91	151
Calms.....	340	368	402	372	385	331	404	438	375
<i>Seasons.</i>									
Mean temperature of Spring.....	54.46	55.18	55.73	56.15	52.97	56.35	54.12	54.63	55.59
Mean temperature of Summer.....	60.40	61.17	59.36	60.07	58.95	60.27	60.06	61.16	61.89
Mean temperature of Autumn.....	57.75	57.67	56.92	56.73	55.86	54.78	56.44	54.25	57.07
Mean temperature of Winter.....	48.20	50.39	50.12	47.60	45.38	51.10	46.80	46.20	47.38
Difference between the warmest and coldest months of Spring.....	4.40	1.49	3.68	.70	9.91	5.12	5.77	5.60	6.16
Difference between the warmest and coldest months of Summer.....	1.99	1.10	.35	1.26	1.88	1.55	1.13	2.78	2.60
Difference between the warmest and coldest months of Autumn.....	6.13	7.76	5.93	9.14	7.70	8.79	9.68	10.64	3.99
Difference between the warmest and coldest months of Winter.....	5.00	6.09	1.28	5.13	2.37	5.34	2.33	5.98	1.56
Difference between the warmest and coldest months of the year.....	16.20	15.25	13.06	15.68	15.78	12.38	14.77	19.26	16.38

FOR NINE YEARS.

Mean difference between the coldest and warmest months for nine years.....	19.67
Mean temperature for nine years.....	55.12
Mean barometer for nine years.....	29.94
Mean relative humidity for nine years.....	83.97
Mean annual rainfall in inches for nine years.....	24.45

MODIFYING CAUSES OF THE CLIMATE

ON THE

PACIFIC COAST OF THE UNITED STATES AND BRITISH COLUMBIA.

FURNISHED SERGEANT JAMES A. BARWICK, SIGNAL CORPS, U. S. A., SACRAMENTO, CALIFORNIA, BY DR. J. B. TREMBLEY OF OAKLAND.

It is said that every country in the world, to a greater or less extent, has a climate peculiar to itself. In many respects it may be similar to that of another, but not identical, for the various factors that go to make it are not always equally alike, or bring the same influences to bear on each individual region of the earth. It was once thought that climate depended mostly on latitude and the declination of the sun either north or south of the equator; but more recent observations show that many other causes which are independent of these modify temperatures and precipitation.

The western coast of Europe and North America are examples of similar climate, modified by the same corresponding causes, ocean and air currents. Without entering into an extended inquiry over the various portions of the world in comparing climatic factors, which would be uninteresting to a majority of readers and embrace more than is designed to be written in this paper; therefore, the knowledge, positive and theoretical, of the climatic conditions that are imposed upon the western slope of the Pacific Coast, bordering on the ocean, from Alaska towards the south, and the causes as far as observed, is all that would interest the local or general reader. The same general causes that modify the climate of Alaska, British Columbia, Oregon, and California, extending into Mexico, have long been known to meteorologists and those who have made physical geography a study. But the many local modifying influences that these great currents of water and air meet with, as they impinge upon the northwestern coast of the continent, by high mountain ranges, inland valleys, and solar heat, gives as various climates as the topography of the country is different where their influence is felt. The ocean current that modifies the climate of the Pacific Coast is a portion of the great equatorial current which is deflected northerly and easterly when it meets the eastern coast of Asia. This current, a portion of the warm equatorial current, as it flows toward the northwest, washing the eastern shores of China and Japan, takes the name of the Japan current, or Kuro-Siwo. At or near latitude 50° and longitude 170° , it divides; one portion, continuing northerly, passes through Behring Straits, the other south of the Aleutian Islands assumes the name of the Aleutian current. It advances eastward until it strikes the northwest coast of North America; then, turning acutely to the southeast, flowing along the western shore, until what is left is drawn into the great equatorial current at or near the Tropic of Cancer, again to make the circuit of nearly a quarter of a hemisphere. Various ele-

ments of this great current, when taken into consideration, that go to make it one of the physical constants in the formation of climate, seems as yet but partially understood. Its depth, width, velocity, and temperature have not been investigated as have some of the currents of the Atlantic Ocean. Professor Davidson, of San Francisco, seems to have been almost the only one who has given this subject any attention, with the exception of some casual observers, who have here and there made memoranda for their own curiosity. The professor starts with a maximum temperature of the Japan current of 88° Fahrenheit. At Alaska, 50.06° . Six to eight hundred miles west from San Francisco, 60.33° ; one hundred miles west, 55.05° . At the tidal station at Fort Point the mean temperature for eight years was 55.66° , that of the air being 54.97° . The mean temperature of the ocean nine hundred miles west of San Francisco for one year was 60.52° , as found by the ocean steamers going and coming from Yokohama to San Francisco. This shows a difference of temperature to be in the water of the ocean current one hundred miles to the west and that at the tidal station on shore to be $.61^{\circ}$ less; at six to eight hundred miles 4.67° greater; at nine hundred miles, 4.86° greater or warmer.

The great ocean current in flowing from its origin to the coast of California has parted with 32.34° of heat; or, in other words, has lost, from the average temperature of the equatorial waters (78°), 22.34° , and leaves an average surface ocean temperature, to the distance of 900 miles west of California, of 57.89° . The temperature of the air along the coast, and the water, hardly ever rises more than two or three degrees, and the above figures show only 2.92° for the average difference in temperature of the water and air over a large area of the ocean contiguous to the Pacific Coast, and gives an explanation of the low temperature at the base of the atmospherical column that rests on the ocean's water. Also the great freedom from rain during the Summer months, when the westerly winds overcast and fogs prevail.

For the purpose designed by this paper, the above is all the information that can be obtained bearing upon the temperature of the ocean's water in the vicinity of this coast, with the exception of the counter or eddying current, said to have been discovered by Professor Davidson; who in describing the great stream that flows across the ocean, remarks that "a branch of this current continues direct to the Alexandrian Archipelago, and, striking the southern part of the coast, is deflected to the northward and westward," and calls it the warm Alaska current, which causes the high isothermal lines that exist directly on the Alaskan coast.

The great aerial air current that moves with the ocean stream, is the counter trade wind of the northern hemisphere, and seems to determine the character of the climate, almost wholly, of California. As it strikes this coast it is always the high current, and flowing from a westerly direction changing but very little the point of the compass at the same date of time in each year.

It oscillates from the south of west at one portion of the year to the north of west at another, moving from north to south with the declination of the sun, and then back again. During the Summer season it blows nearly from the west, and in the Winter, being acted on by the polar winds, is given a more northwesterly direction.

Physical geography has so well described the great systems of atmospherical currents that it is superfluous to enter into a description of all the winds, and the laws that produce them. Owing to solar heat,

and the diurnal motion of the earth, three distinct belts or systems of winds are produced. Easterly winds in the tropical zone, westerly winds in the temperate zone, and northerly or northwesterly in the higher latitudes. These zones of wind move bodily to and fro with the vertical rays of the sun, toward the north in Summer, and toward the south in the Winter. On the movement of these zones of water and air, rests the causes of the wet and dry seasons over the great area of country bordering on the western coast of the United States.

The most philosophical and scientific dissertation, perhaps, on this subject, for depth of research, long and patient labor, appertaining to the wind currents, climate of California and contiguous territory, was made by the late lamented B. B. Redding, and read before the Academy of Sciences in San Francisco, in January, 1878. His observations are as follows:

As California is within the northern temperate zone, it is primarily to the movement as a body north or south of this belt of wind that we are indebted for our dry Summers and Winter rains. Where, within the tropics, the northeastern and southeastern trade winds meet, is a region of calms and rains. This belt of calms and rains, as has been stated, moves northward and southward with the sun's declination. Where, within the temperate zone, the northern and northwesterly winds from the polar regions meet the westerly return trade winds, is a region of storms and rains. These belts also follow the sun's declination north and south. Applying these laws to this coast, at our midsummer the vertical sun would be on the Tropic of Cancer, and in that vicinity the northeasterly and southeasterly trade winds would meet, create ascending air, consequently calms. This air, laden with moisture, would rise into cooler regions, when a portion of its moisture would be precipitated, making tropical rains. This air would flow north and south, towards the poles. Confining our view to that portion which would flow toward the north pole, the larger part of it must descend to the earth within thirty degrees of latitude, under the law as stated by Professor Henry. As in going north it continuously has to pass over a portion of the earth which is moving less rapidly than the portion it has left, it is deflected and becomes a southwest wind. The greater portion of this upper current having descended to the earth within thirty degrees, and returned to join the trade wind, the remainder would flow towards the pole, portions descending in its course at all points where the rarification of the air near the earth's surface would permit. These descending currents cause the local variable winds of our temperate zone, but the aggregate of all of them is the prevailing westerly return trade wind. The descending currents cannot give rain, as they only fall to the earth when they become colder than the air near the earth's surface. In falling they are constantly arriving at places of warmer temperature than those they have left; they, therefore, change to a condition of taking up moisture, rather than of parting with it. *Where the great body of the descending return trade wind reaches the earth between latitudes twenty-eight degrees and thirty-five degrees, must, therefore, on this coast, be comparatively a rainless region.* Other lessening portions of the upper current would pass on until they met the prevailing northerly wind from the polar regions, when their temperature would be lowered and their moisture condensed and fall as rain. The conflict of this descending current with the polar wind would create storms and give rise to electrical phenomena. The prevailing northerly polar wind reaches to about latitude sixty degrees, varied by the declination of the sun.

This view of the causes of the tropical, temperate, and polar zones of prevailing winds, is in accordance with the theoretical deductions of Professor Ferrell concerning the course of atmospheric currents moving on a sphere, and appears to be confirmed by the belts of low barometer prevailing in the vicinities of the equator, and of latitude sixty degrees. The polar wind, being colder, is heavier than the return trade wind, and where they meet, the tendency is for this polar wind to become a surface wind, and prevent the upper current from reaching the earth until it has been reduced to the same temperature. The operation of these general laws can be more clearly seen on this coast than on that of the Atlantic and Gulf States. There, the northeast trade winds are forced into the great caldron of the Gulf of Mexico. The Cordilleras of Central and South America and Mexico form a wall against their progress; they rise, turn to the north as an upper current, and return to the earth as southwest winds.

The Rocky Mountains, one great chain of which extends from the center of the continent northwesterly to the Arctic Ocean, assist in the deflection. The great prairies extend in an unbroken line in the same direction from the mouth of the Mississippi, to the same frozen ocean at the mouth of the McKenzie River, in about latitude sixty-two degrees. Professor J. W. Foster, in his work on the "Physical Geography of the Mississippi Valley," states that the sources of the Mississippi River are but 1,600 feet above the ocean. Professor Coffin has shown from the records in the Smithsonian Institute, in his article on the "Winds of the Northern Hemisphere," that between latitudes sixty and sixty-six degrees there prevails a belt of easterly and north-easterly winds. These winds, coming from the Arctic Ocean, meet the great chain of the Rocky Mountains, are deflected into northwest winds, and pass unobstructed along this great stretch of prairie land into the States east of the Rocky Mountains. The conflict between the northwest

polar winds and the moisture laden southwest winds from the Gulf of Mexico, gives all the Atlantic States north of Florida their Summer rains. As far back as 1850, Professor Espy, in his second report on meteorology to the Secretary of the Navy, without, at that time, more than suspecting the cause, reported as the result of a long series of observations, that in the northern part of the Atlantic States the winds generally, in great storms, set in from north of east, and terminate from north of west, and in the southern part of the Atlantic States they set in from south of east and terminate from south of west.

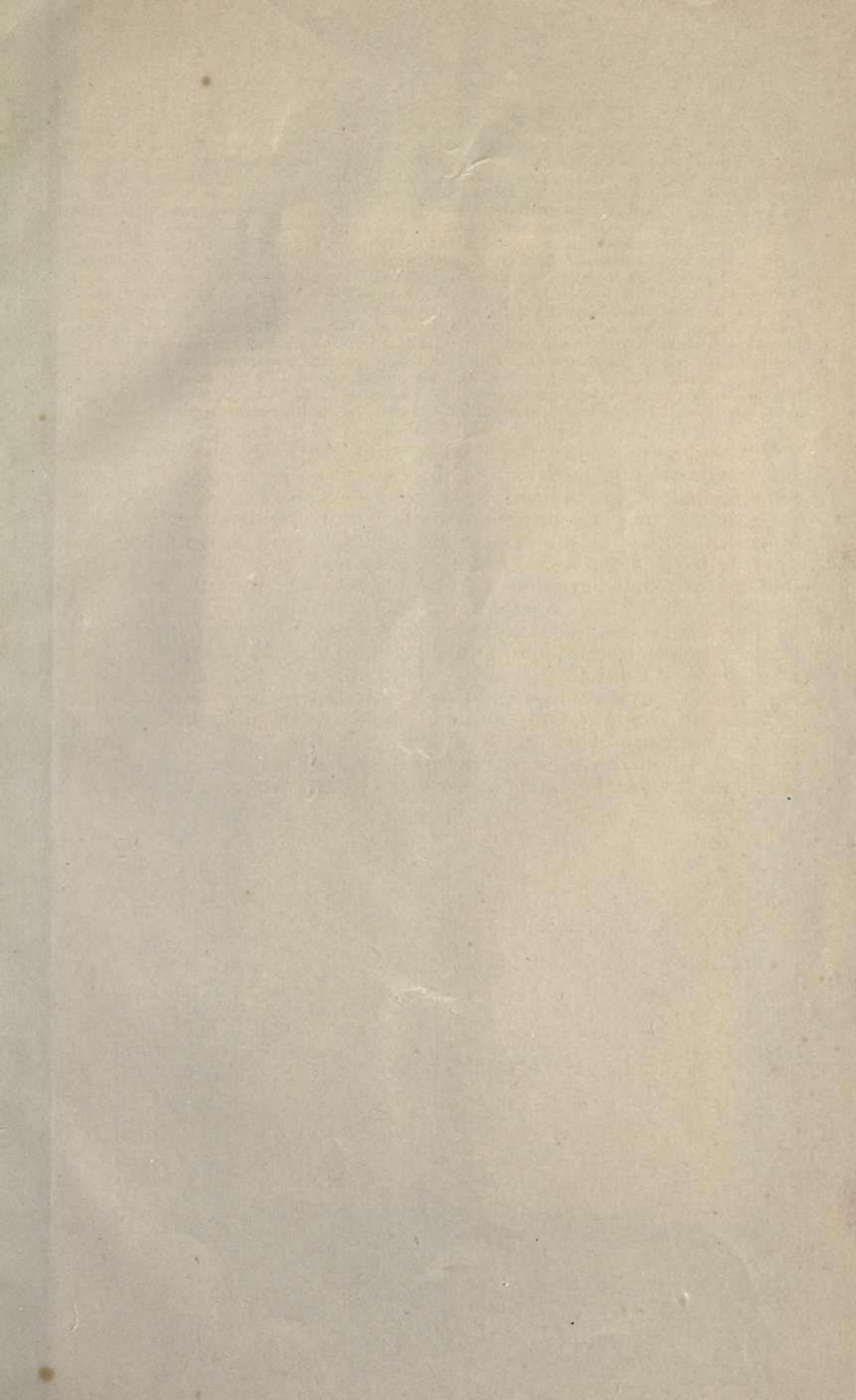
It is doubtful if the Atlantic trade winds ever give rain to California. That portion which passes the mountains through the valley of the Rio Grande, precipitating its moisture on the White Mountains and Black Hills of Arizona; which, by the meteorological records of the Smithsonian Institute, are shown to have an annual average of twenty inches of rain.

That these general laws may be applied to California as the cause of our climate, I will assume to follow a given portion of air along well known points on the coast. At midsummer, at noon, the sun would be vertical in Southern California just north of Cape St. Lucas. In this vicinity, this portion of air, having been a part of the trade wind, would have become heated and saturated with moisture. It would rise until it met colder regions, when it would part with some of its moisture; a portion would return to the earth within thirty degrees, again to join the trade winds, and another portion pass on towards the north as a part of the great upper current. Under the operation of Professor Henry's law, the greater part must return to the earth between latitude thirty degrees and, say, latitude thirty-five degrees; the remainder would flow on towards the pole until it met the prevailing northwesterly winds; at these points there would be fogs and Summer rains. Whenever the polar wind forced its way south of this, it would condense the moisture of these descending return trade winds and give rain. This they would do until they had passed so far south that their temperature would be raised to that of the descending return trades, when, of course, no moisture could be precipitated. It is these polar winds, forcing themselves among the descending return trade winds, that give British Columbia, Washington Territory, and Northern Oregon their Summer showers. Should they force themselves further south, they, in their passage, have to pass into warmer latitudes; they would also meet the heat of our great valleys and deserts, and become as warm as our prevailing Summer wind, and, therefore, could not give California Summer rains.

But, from midsummer, the sun is for six months moving south, taking with him the great belts of winds of the tropical, temperate, and polar zones, until, at our midwinter, his rays are vertical just north of the northern part of Chile, in South America. These belts, moving south with the sun during six months, the region of conflict between the polar winds and the variable winds which in Summer was over British Columbia, Washington Territory, and Oregon, has now moved south over Oregon and the northern and middle part of California. The temperature of the earth's surface and the air in contact with it, have been lowered by the withdrawal of the sun's more direct rays, and the polar winds are permitted to reach further to the south without increasing their temperature. The region of calms and the southern limit of the variable winds have, of course, also moved south with the sun, beyond the Tropic of Cancer. At this season, in the Pacific, the trade wind is not usually found north of latitude thirteen degrees, when, in Winter, the descending return trade wind, coming from the southwest, meets the coast south of Cape St. Lucas, it is forced by the Cordilleras and the configuration of the main coast into the Gulf of California, and is deflected into a course from the southeast, or, to be more exact, as shown by the records kept by Dr. Gibbons, into a course from the south-southeast. Without doubt, the southwest return trade wind which strikes the coast of Lower California in Winter north of Cape St. Lucas, is deflected by the high mountains parallel to the shore, and also passes over our coast counties as a southeast wind. H. S. Warner, in a paper read before the American Association for the Advancement of Science at its Baltimore meeting in 1858, was the first to note the fact that the waters of the Gulf of California supply the moisture to the southeast wind that bears to us our rains. It may be objected that the Gulf of California has not sufficient area from whence could be delivered the great volume of southeast winds that, at times, during our Winters, flow over this State. The gulf is not the cause of this wind, but it is the channel through which it flows, and gives to it direction. When the sun is vertical on the coast of Bolivia, just north of Chile—at our midwinter—he has carried south with him the northeast trade winds, until, as has been stated, they do not prevail north of about latitude thirteen degrees. The region of calms, where the great body of the upper current returns to the earth again to join the trade winds, is, at this season, between latitudes thirteen and eighteen degrees. North of this region of calms, at this time, those portions of the upper current which pass further north, descend to the earth, under Professor Henry's law, as southwest winds. At latitude twenty degrees, the west coast of Mexico projects a bold headland into the Pacific Ocean, known as Cape Corrientes. South of the Cape the trend of the coast for nearly two thousand miles is east-southeast; north of this cape, the trend of the coast for more than one hundred miles, to Mazatlan, is north; from Mazatlan to the head of the Gulf of California, a further distance of six hundred miles, it is north-northwest. The Sonora arm of the Cordilleras rises above the table land of Mexico, at latitude twenty degrees, and runs north-northwest along the coast, nearly to the head of the Gulf of California. All of these southwest winds that strike the coast from Cape Corrientes north to Cape St. Lucas, are deflected by these mountains and forced up the Gulf as south-southeast winds. The United States Coast Survey have lately completed the survey of this gulf and parts of the Mexican coast north of Cape Corrientes. When their record of observations of the course of the prevailing winds in Winter, the barometric pressure and the temperature of the air and water is published, I feel

confident that it will be found that the southwest return trades prevail in Winter north of Cape Corrientes, and are turned by the mountains and the coast up the Gulf of California, and so over this State as our southeast winds. It comes from this gulf warm and laden with moisture, and passes over the Colorado and Mojave deserts. These deserts, as shown by the meteorological records of the Smithsonian Institute, have a mean Winter temperature of from forty-eight to fifty-six degrees. This is not sufficiently low to precipitate its moisture, and it passes on until it meets the Sierra Nevada and Coast Range. In ascending these it rises into cooler regions, finds a mean Winter temperature of forty degrees, and gives up some of its moisture. When it flows down into the southern end of the great valley of the Tulare, it meets a mean Winter temperature of forty-eight degrees, which is higher than that of the mountains it has just passed. It therefore retains its moisture and passes on, until it meets a cold polar wind, and has another portion of its moisture condensed in a rainstorm, or, failing to meet this, passing still further north, until its moisture is condensed by the prevailing low temperature of a higher latitude. It is of frequent occurrence in Winter that a gentle southeast wind will blow for days, giving no rain south of the latitude of San Francisco, but cloudy weather at the northern end of the Sacramento Valley, and light showers and rains from Red Bluff to Oregon. Therefore, the northern part of the State should receive more rain than the southern, and the mountains more than the valleys. The least rain should be in the hot deserts and on those sides of valleys most sheltered by mountains from the moisture-bearing winds.

Meteorological observations, taken since the writing of the above, fully confirm the assertion made respecting the rainfall, however phenomenal it may appear to be, and show, conclusively, that the precipitation in all the territory tributary to the influence of the above factors of climate, is subservient to meteorological laws, the same as in other parts of the world, differing only as the physical causes differ that produce the resultant effects. The average annual rainfall at Crescent City, in the extreme northern part of the State of California, is thirty-six inches, and diminishes about two inches for every degree of latitude towards the south, until, at San Diego, it is but ten inches. In altitude, it is found to increase about one inch for every one hundred feet in elevation in ascending the windward side of the Sierra Nevada range of mountains. Local causes have influences bearing upon the amount of rainfall in different localities, but they are nearly all topographical; and, when carefully studied, are easily explained, either for the small or great amount of average rainfall they receive.



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